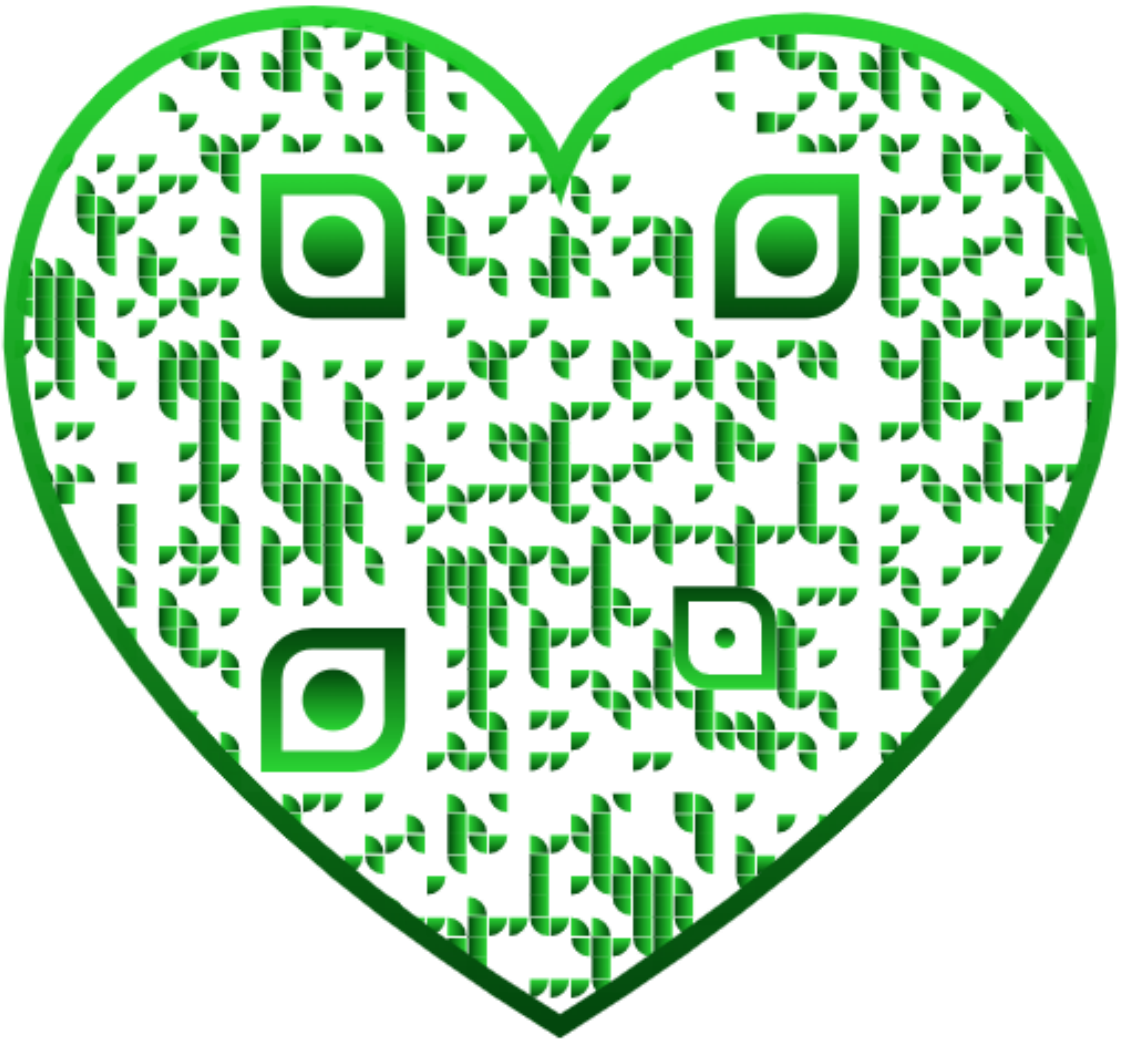
HYDROPONICS

The Kratky Method

The **Cheapest** And **Easiest** Hydroponic System For **Beginners** Who Want To Grow Plants **Without Soil**

DEMETER GUIDES



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HYDROPONICS: THE KRATKY METHOD

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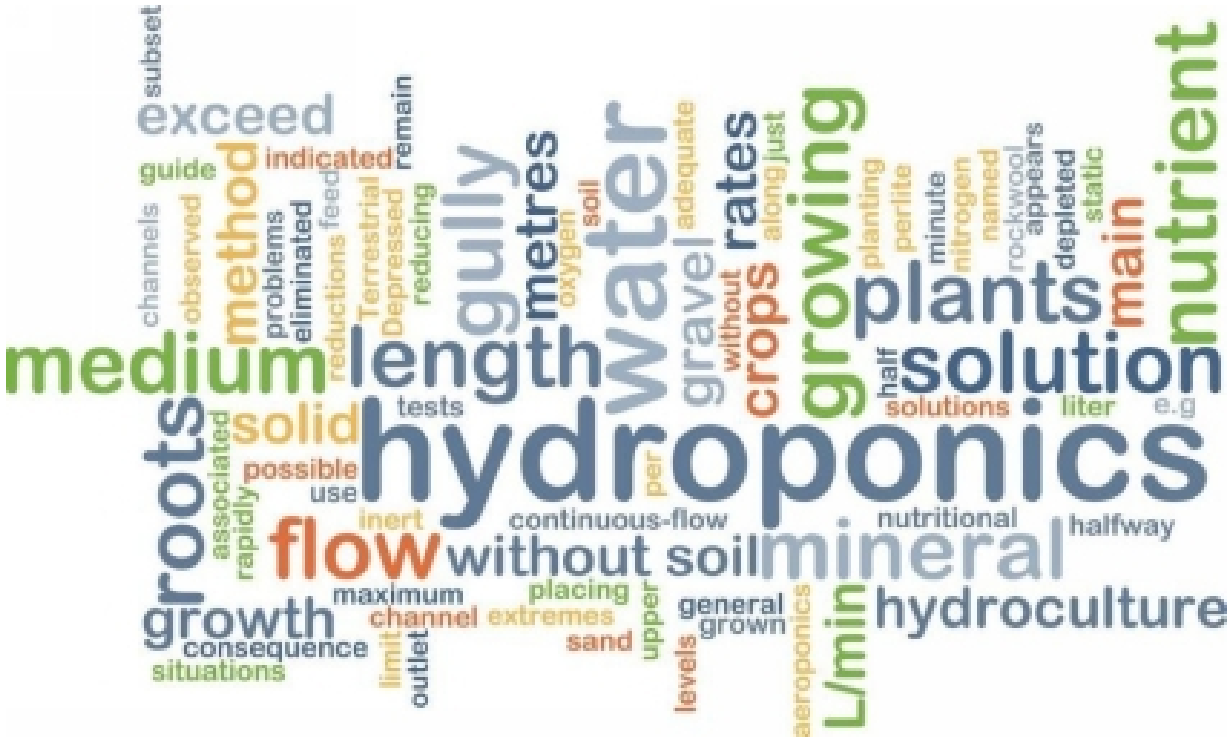
INTRODUCTION



Hydroponics has been growing in popularity over the last few years due to the control it offers gardeners over their crops. Simply put, hydroponics refers to growing plants using a nutrient-rich water source rather than growing in a soil-based setup. When the level of control it offers is combined with the flexibility to set up a hydroponic garden indoors, outdoors, or in a greenhouse, it is easy to see why hydroponic gardening is catching on in a big way.

Which is what brought you here in the first place. You've heard about hydroponics, and you're interested in getting started, but you just don't know where to start. You've

heard the term, and maybe you've heard the phrase "deep water culture" or "wick system," but you don't know what those mean. Searching Google for more information brought back too many articles to dig into, and the whole concept of hydroponics has started to seem like more trouble than it's worth.

If any of this sounds familiar to you, then don't worry, you've found just the book you need.

In *Hydroponics: The Kratky Method,* you will be introduced to the most effective hydroponic setup for beginners and shown how to build your own Kratky method hydroponic system.

You will first learn about the science behind hydroponics and the main approaches that gardeners use. Then you'll learn why the Kratky method blows them out of the water and makes hydroponic gardening easy and effective. You'll see the many pros to using the Kratky method and which crops are best grown in a Kratky system.

Following this early section of theory comes the practical knowledge you need to make your own system. You'll be walked through all the equipment that is required to create a system, and you'll see how it all fits together to build your hydroponic setup. You'll learn all about mixing the perfect nutrient solution for your plants, and what growing media is best used with the Kratky method. From there, you move on to monitoring your system, keeping it safe from pests, and how to maintain the system to keep it nice and clean. All of this will be followed by a look at some of the most common mistakes that new hydroponic gardeners make so that you have the know-how to avoid making the same mistakes yourself.

By the time you finish with this book, you will know everything you need to organize a hydroponic garden using the Kratky system so that you, too, can master hydroponics and start growing amazing crops.

CHAPTER ONE: THE SCIENCE OF HYDROPONICS

Hydroponic gardening has been seeing an unparalleled rise in popularity over the few years, and it is showing no sign of slowing down. Commercial growers and hobbyists alike are learning about these methods and starting their own hydroponic systems to grow amazing crops. In this chapter, you will be introduced to this amazing agricultural tool and the six basic types of setups so you can understand exactly why you should start growing your plants hydroponically.

What Is Hydroponics?

Hydroponics is a combination of hydro and ponos, ancient Greek words that mean water and labor. This is fitting because work is exactly what the water in a hydroponic system does. This growing technique may be becoming popular these days, but evidence of its use dates as far back as the Hanging Gardens of ancient Babylon. Cultures as varied as the Aztecs in Mexico and the Egyptians in North Africa made use of hydroponic growing methods. But don’t think that makes this an outdated system. NASA made hydroponic gardening a part of the space program because it would be a possible way to establish food production should humanity reach the stage of colonizing Mars. But because it is studied as an adjunct to rocket science doesn’t mean it is hard.

Hydroponic gardening is a way of growing plants in water rather than in the ground or potting soil. The roots of plants are typically in soil and are fed a nutrient-rich liquid solution. Certain setups favor exposing the roots of the plants to open air as well, so that they are allowed to breathe. A plant can be placed into a growing media other than soil. This technique allows plants to be grown anywhere you like, so long as the environmental attributes match the plants' needs.

Some hydroponic systems use running water, others prefer a reservoir of sitting water, and others like to introduce water as a slow drip over the growing media more akin to traditional plant watering. The core feature of a hydroponic system is that the necessary nutrients plants need to grow are delivered through the water rather than through the soil. This simple feature might not sound like much, but it is completely revolutionizing the agricultural field lately because it has a ton of practical uses and just as many hidden benefits. Let's take a look at these so you can see exactly what all the fuss is about.

The Benefits Of Hydroponics

The top benefit to growing plants hydroponically is the flexibility of location that it offers. You can grow plants outside (though it’s not recommended), in a greenhouse, in your house, or even in a small apartment. Hydroponic gardens can be designed to be large or small, so it is able to fit whatever size you need. As long as you can provide the proper amount of light, the right temperature, and humidity, then you can grow plants out of season, or even out of climate, through this system.

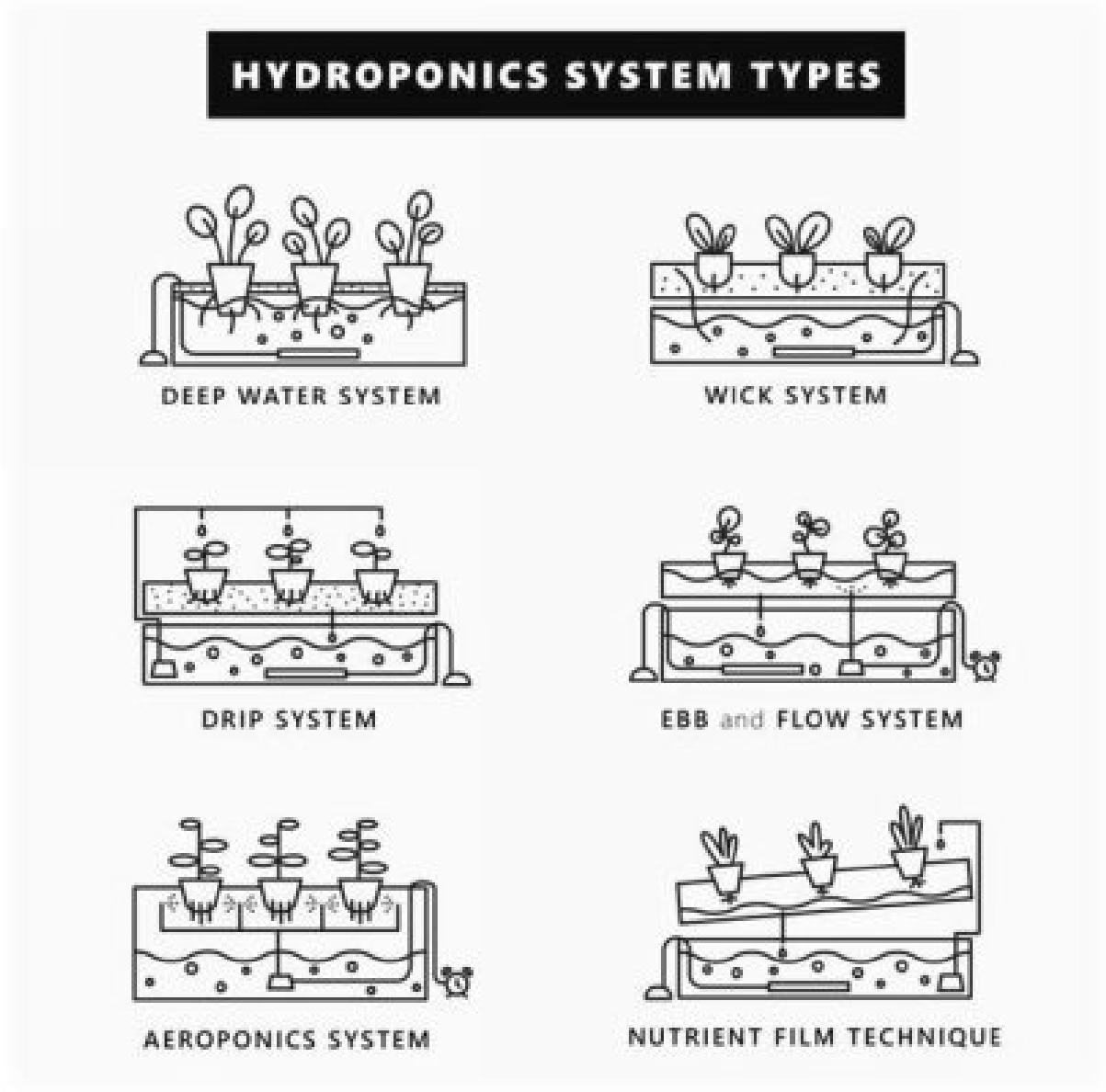
If this were the only benefit that hydroponic gardens offered, they would still be quite remarkable, but the truth is that it barely even scratches the surface. Hydroponic gardens are known for producing tastier

vegetables, and herbs grown hydroponically are upwards of 30% more aromatic than those grown in soil. Because hydroponic gardens are so closely observed, and the nutrient demands of the plants are provided perfectly, the yield of hydroponic harvests is known to be often larger than soil-grown plants. Better yields equal better profits, so it makes perfect sense why growers are switching over to hydroponic operations.

Hydroponic gardens have also caught the interest of growers interested in green practices and environmentalism. Because such gardens remove the reliance on soil, there is no need for the use of powerful pesticides. While hydroponics gardens aren’t free from pests of their own, many of the infestations that lead to pesticide use are found in the soil rather than on the plants themselves. Setting up your own hydroponic garden allows you to avoid having to use these chemicals. When commercial growers adopt these practices, it makes the quality of our living even better since we get clean air, water, and soil out of the deal.

Even though hydroponics is entirely based around water, it actually uses much less water to raise crops hydroponically compared to doing it via the traditional soil approach. This water can even be reused, depending on the make of the system, which equals even more water saved. It also means that you don’t need to set up a watering schedule for your plants; they are getting plenty of water already. Of course, this isn’t an excuse not to keep an eye on your plants, but it offers you the flexibility to pick when in the day you do this.

Growing indoors can be messy when you are filling up containers with soil and mixing in mulch and compost. Since hydroponic gardening removes soil from the equation, the biggest mess is often only some spilled water. Getting rid of fertilizer or compost also means that your house doesn’t have unpleasant smells every couple of weeks. Hydroponic gardening allows you to grow wonderfully rich plants and vegetables without having to get your house or hands dirty.



When it comes to hydroponics, there are six setups that are most commonly discussed. If we briefly see how each of these works, it will give you a primer on the subject of hydroponics, and the core concepts of how a hydroponic system functions.

The Six Types Of Hydroponic Systems

Most hydroponic systems fall into one of six types: Drip; Aeroponics; Ebb & Flow; Wick; Nutrient Film Technique; or Deep Water Culture systems. Let’s look at each one of these in turn.

Drip System: A hydroponic garden, grown using the drip method, will seem more natural to those growers used to soil gardening. A drip system uses a top-down method, similar to the ebb and flow system, which requires water to be moved through the growing media the plants rest in. Plants rest in your chosen growing media inside of individual pots. These pots then rest in a tray, which is tilted at a slight angle so that water flows down to one corner. This corner has a drainage pipe that allows water to escape down into a second container, which includes the primary nutrient solution. This nutrient solution has a water pump inside, and this is rigged to drip water on to the plants.

Drip systems directly provide every plant with its own steady nutrient drip, the speed of which is controlled by drip emit ters, which growers can adjust and fine-tune. Drip systems can be circulating or non-circulating, with circulating systems dripping much more often than non-circulating systems. Most growers go for circulating systems, those where the top container drains back into the reservoir at the bottom. A drip system allows you to measure exactly how much solution your plants will be getting. This feature makes a drip system versatile enough to grow multiple species together in a single

setup, so long as their nutrient needs share the same ratios.

Aeroponics: Aeroponic systems are among the hardest hydroponic systems to organize and maintain. In an aeroponic system, the nutrient solution is stored in a reservoir that your plants dangle above. Typically, there are holes in the cover of the nutrient solution that are big enough to put a plant pot into. The plants are kept in a growing media that is solid enough to stay in one piece, in a container with plenty of openings. This allows the roots of a plant to dangle down, almost touching the nutrient solution. A water pump is set up, along with a couple of mist nozzles that spray the roots of your plants on a set timer.

Nutrient solution sprays onto the roots of your plant, which can then absorb as much as they need at a given time, while the rest drips off and falls back into the reservoir below. Aeroponic setups can require a lot of maintenance. They are prone to clogging, and that can be deadly if the problem is ignored for any length of time. In hydroponics, your plants are absolutely reliant on the nutrients that have been dissolved into their water source. Despite the need for more maintenance, these systems are known to produce impressive plants because of all the oxygen that the roots can enjoy. An aeroponic setup can definitely be worth the time and effort it requires. However, beginners shouldn’t even begin to consider aeroponics until they have more experience with hydroponics.

Ebb & Flow: The ebb and flow system gets its name from the way that this system pumps water into a grow container and then lets it drain. This is similar to the drip system, except, instead of a constant drip, the system floods the grow box at set intervals and then allows it to drain fully. That's how they get their other name, "flood and drain" systems. Plants are placed in a large grow-bed that rests above your nutrient solution reservoir. A pump floods this grow to a pre-established level, and then a drain in place allows the nutrient solution to seep back into the reservoir at its own pace until it is dried completely. At that point, the whole process begins again. These systems are also prone to clogs, but, since the flooding process is visual without taking the top off the reservoir, it is much more straightforward to identify and fix problems with a nutrient delivery system. Ebb and flow systems are best used for smaller plants as space runs out quickly in an ebb and flow system, and plants that grow too close to each other can lose energy trying to fight each other for the same nutrients. Ebb and flow systems are also best used for plants that have short root systems; the longer a plant's root system is, then the deeper the grow tray needs to be, and the more water that is necessary to properly flood it.

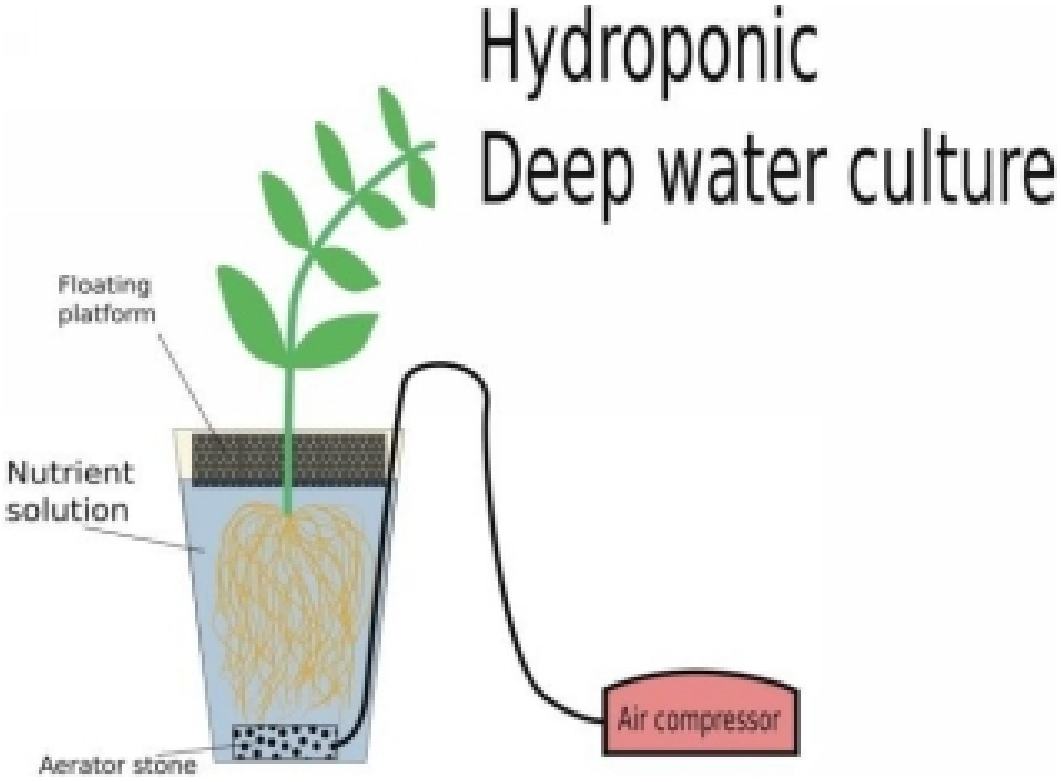
Wick: The wick system is the least tricky of the hydroponic setups out there. A nutrient solution is stored in a reservoir below a grow tray with your plants in it. A grow medium like vermiculite or perlite is used in this grow tray because they are absorbent. This is important because there are no pumps, tubes, or sprayers, providing nutrients to your plants. All the nutrient solution they get will be provided through small pieces of nylon that are run between the growing media and the

nutrient solution. The nutrient solution will be absorbed through the nylon, and plants will then soak it up above. That’s all there is to wicking; it really is the simplest setup.

But it is far from the best. A wicking system is only able to transport a small amount of the nutrient solution to the plants in the grow tray above. This means that you can only produce small plants in a wick system; medium to large ones are going to demand to be fed more. Because of this, the wick system is best used to grow small herb gardens or keep alive a single houseplant. It might be the most accessible approach, but it is also the most limited in terms of the options it leaves open for hydroponic gardeners.

Nutrient Film Technique: This technique gives the plants roots direct contact with the nutrient solution on a permanent basis. A pump is placed in the nutrient solution reservoir and connected to a grow tray with holes cut in the lid for plant pots to be placed. The grow tray is on an angle so that water flows down into a drainage pipe and back into the reservoir.

The pump is turned on at all times so that there is always water moving over the roots of the plants. The plants in a nutrient film technique will be directly connected to the water as a growing medium is typically not used in this style of hydroponic system. Nutrient film technique growing operations are most effective when used with plants that have smaller root systems. Plants like lettuce do quite well in a nutrient film technique system, but plants with long roots will find themselves cramped for space, and this might cause issues in overfeeding. Overfeeding is a problem as too many nutrients can cause “nutrient burn,” a sickness that leaves your plants weak and frail.



Deep Water Culture: A deep water culture structure is best used for plants with long roots as they are given a chance to stretch out as much as they need to. This simple hydroponic system is built by cutting holes into the lid of your nutrient solution reservoir and placing plants in the holes so that they directly rest in the nutrient solution itself. There is no need for a pump to move the nutrient solution through pipes or tubes, but an air stone does need to be added to the nutrient solution so that the roots of the plants can get the oxygen they need. The combination of plenty of oxygen, and an endless supply of nutrients, makes plants grown using a deep water culture some of the largest you can imagine.

The deep water culture is the best choice for plants that have long roots or those that produce fruit or vegetables. Plants that produce fruit will see the benefits of the deep water culture technique when it comes time to harvest.

Plants grown within a deep water culture are known for having absolutely massive yields, making it one of the best approaches for gardeners focused on growing edible crops. Keep in mind that a deep water culture system does require an air pump connected to an airstone, and this piece of the system can break down on you. For that reason, a deep water culture system takes a fair deal of maintenance.

The Seventh Hydroponic System

The six systems that we explored above are the most common, and therefore popular, setups for hydroponic gardens. But that doesn't mean they are the only approaches that exist. In this book, we are going to leave these six approaches behind and focus on a seventh. There are more than enough books that delve into drip, nutrient film technique, ebb & flow, deep water culture, aeroponics, or wick based hydroponic systems. But, there hasn't been nearly enough written about the seventh, easiest, and remarkably effective way: the Kratky method.

The Kratky method combines the ease of a wick system with the effectiveness of a deep water culture, making it not only the best approach for beginners, but also one the most productive approaches to hydroponics in general. By learning and putting the Kratky method into use, you will have big, beautiful plants in no time. Keep reading to find out more about this impressive method that other hydroponic teachers are only just starting to discover.

Chapter Summary

✓ Hydroponics is a method of gardening that uses nutrients dissolved in water to raise plants rather than grow them in soil.

✓ Hydroponic systems can use running or still water, although running water systems will require electric components like pumps.

✓ Plants can be grown hydroponically indoors and out of season. Hydroponically grown herbs are 30% more aromatic. Plants grown hydroponically tend to have larger tastier yields.

✓ Hydroponic gardening uses less water than traditional gardening, and so it is better for the environment.

✓ There are six key types of hydroponic systems: drip, aeroponics, ebb & flow, wick, nutrient film technique, and deep water cultures.

✓ Drip, aeroponics, ebb & flow, and nutrient film technique systems all use circulating water.

✓ Wick and deep water culture systems don’t require any circulating water, although deep water cultures will still need an airstone and pump to provide oxygen to the plants.

✓ The most effective and easiest system to use is the less- often discussed seventh system: the Kratky method system.

In the next chapter, you will learn all about the Kratky method. What exactly is this passive method of

hydroponic gardening, and why does it work so well? Both of these questions will be answered in the next chapter so that you can see why the Kratky method is the perfect choice for beginners!

CHAPTER TWO: KRATKY METHOD - AT A GLANCE

The Kratky method is one of the newest discoveries in the world of hydroponic gardening. Developed by Bernard A. Kratky, a researcher emeritus at the University of Hawaii in the Department of Tropical Plant and Soil Sciences, this method is unique in the world of hydroponics because of its lack of moving parts. There is no need for an air pump to aerate the water, no need for a pump to move nutrient solution around, no requirement in fact for the water to move at all, and no need to change out the nutrient solution either. The closest that a typical setup comes to the Kratky method is a wicking setup, as it also has no moving parts. But a wicking setup can only be used to grow small houseplants or herbs. The Kratky method can be used to produce harvests as impressive as those in a deep water culture.

What Is The Kratky Method?

The Kratky method looks a lot like a deep water culture system, only without the airstone to keep the nutrient solution filled with oxygen. A reservoir of nutrient solution is set up and a cover is placed over the top. The cover has holes cut out into it, so that plant pots are able to fit into it. The pots used with the Kratky method are crucial, as they have to be net pots. These pots can be made out of anything, although plastic is the most common material used. They look more like laundry baskets than they do plant pots, as they are designed to have dozens of holes and slots through which soil would fall out. A growing media like hydroton or rockwool is used because it is a large enough size that it won't fall out through these holes.

The reason why it is the type of growing container your plant rests in so important is due to the nature of the Kratky method. As there is no air or water movement within the nutrient solution reservoir, net pots are used so that the roots of the plants will have as much contact with the nutrient solution as possible. The plants' roots will start to grow, sucking up as much nutrient solution as they wish. Since the Kratky method is a non-circulating approach to hydroponics where you don't change out the nutrient solution, the plants will begin to empty out the reservoir. As this happens, the roots will start to dangle in the air above the water, and it is this that allows them to get the oxygen they need. If the Kratky method used a reservoir that circulated the water, then it would require an airstone, but since it is left to be

drained by the plants, there is plenty of oxygen to go around.

That is all there is to the Kratky approach. Plants are left to dangle and drink up the nutrient solution, and so you don’t need to worry about any moving parts breaking down on you. The plants, however, are getting tons of nutrients and oxygen - precisely what they need to grow nice and large. There is a catch, however, which is that the Kratky system is not perfect. Not every type of plant grows well in the Kratky method. For example, tomatoes and cucumbers are both a little too nutrient-dependent to be grown in this way without a little extra work. That is, they are going to need much more than a single reservoir of nutrient solution, and this is better provided by a circulating system. Note; it is possible to grow these plants this way, but only when extra steps are taken.

This makes the Kratky method a bad choice for beginners that are hoping for crops such as these, though it only makes it about as difficult as a deep water culture is. Where the Kratky system stands out the most, is when it is used with crops like lettuce or spinach, crops that don't go through a fruiting stage.

We'll take a look at more crops that love the Kratky method in Chapter Four. For the time being, let's see why this system is such a good fit for beginners of hydroponic gardening.

Why Is The Kratky Method A Great Idea For Beginners?

The reason the Kratky method is such a great fit for beginners is firstly due to the nature of its discovery. Kratky is a researcher on gardening. Specifically, the area of the University of Hawaii that he works in is the Department of Tropical Plant and Soil Sciences. One of the biggest environmental problems that the human race is starting to face, and will continue to face, in the years to come, is the degradation of soil quality due to chemical treatments and being over-worked to increase profit margins. If humanity wants to continue being able to eat fruits, vegetables, and other plant-based dieting staples, then new methods of growing food need to be discovered.

The best way to ensure that people can keep themselves fed through their own gardens is to find the most straightforward method possible. A hydroponic system needed to be invented that anyone in the world could learn and benefit from. The skills intrinsic to this would benefit the widest possible audi- ence. Kratky discovered this method, and now the world (though just as importantly, you!) can learn what Kratky found, and see precisely why it is the perfect method for beginners.

To start with, most hydroponic systems require electricity to function. Pumps, sprayers, airstones, all of these pieces are common in hydroponic setups, but every one of them requires electricity to work. This has three major drawbacks. First, it increases your electricity bill. Second, if you lose your power for an extended period of time,

then your plants are going to suffer. Hydroponics is ideal because you can grow plants during the winter, and if a snowstorm knocks out your power like it does millions of homes each winter, then it doesn’t even matter. Third, the Kratky method can be used in countries and communities in which electricity is not yet a common commodity. The Kratky method can be employed to fight world hunger because of its passive design.

The simple design of the Kratky method makes it much easier to get started, and this is wonderful news for gardeners who are only looking to dip their toe into hydroponic gardening for the time being. The only equipment you need for a Kratky system is a bucket in the 5-gallon range, a couple 3-inch net pots, and perhaps a hole bolt. You will need to use something to cut holes in the top of the bucket to fit your nets in. A growing medium, nutrients for your solution, and a little pH kit, and you have everything. This makes for a tiny shopping list when you are first getting started, making the Kratky method the cheapest way to begin using hydroponics. Pretty much everything you buy to get started will be reusable for several grows, as raw supplies are typically bought in large enough quantities for intermediate growers, and beginners use up less. The low cost makes the Kratky method more available to a greater population, and it provides beginners with an introduction to hydroponics.

A Kratky system is also simple to put together. The hardest part of the Kratky design is cutting holes into the lid of your buckets or nutrient solution reservoirs. If you can cut a hole, then you can make a Kratky system. Everything slots together in the end, and there aren’t any loose pieces, like hoses or sprayers, that you need to be

careful about. Mixing the nutrient solution is the second hardest part, and all this takes is measuring out a few gallons of water and then measuring and adding in liquid nutrients. If you have the skills to make coffee or Kool-Aid, then you can make a nutrient solution no problem! Once everything is in place, the Kratky method operates itself.

This makes the Kratky method the absolute best choice for those looking to get started. But there are many other pros to the Kratky method.

Chapter Summary

✓ Bernard A. Kratky developed this method of hydroponics at the University of Hawaii.

✓ The Kratky method has no moving parts. It requires no electricity (so long as natural light can be provided), and it is the most inexpensive system to build and run.

✓ The Kratky method is achieved by hanging plants in net pots above a nutrient solution. As the plants drain the solution more room for oxygen is created to provide plenty of air to the roots.

✓ Since there are no moving parts and little maintenance, the Kratky method can be thought of as a “set it and forget it” approach to gardening.

✓ The Kratky method is great for beginners because it was designed to be easy to learn and affordable to maintain.

✓ Removing the need for electricity means that there are no parts that can break down and ruin the system. It also means populations without electricity can still grow their food easily.

✓ When you have gathered all the materials for a Kratky system, you basically just need to snap them together into place. Building the system is extremely easy and makes it terrific for beginners.

In the next chapter, you will learn about the many advantages that the Kratky method has going for it. You will also learn the cons associated with the method, though I’m sure you will notice the disparity in the ratio between the pros and cons.

CHAPTER THREE: THE PROS OF THE KRATKY METHOD

The Kratky approach is an excellent choice for beginners. But the key features we looked at in the last chapter aren't the only pros to using this system. There are a lot of them, as you will see in this chapter. We are also going to look at the cons in this chapter. This is so that you get an honest view of the Kratky system and understand its limitations. That said, I hope you'll see just how many more positives there are.

The Pros

Cost: As we discussed in the previous chapter, the Kratky method is the single cheapest way to get started growing plants through hydroponics. If you can get access to the nutrients required to create the right solution, then the rest of the material used in the Kratky method can be made out of things found around the house if need be. It is suggested that you purchase fresh growing media, but you can use any bucket or container you have around the house, so long as you thoroughly clean it before you do use it. The low cost of the Kratky method makes it excellent value for beginners and experts alike.

Simplicity: Another pro that we've touched on already, the simplicity of the Kratky system, makes it a fine choice for beginners, but it is also an advantage for experts as well. Plants that take well to the Kratky system can be grown without any difficulty. It is basically an automatic system, And so growers can set up their leafy greens using the Kratky method and forget about it. This is great even for people who already have a hydroponic system. They can focus their time and attention on their main system while a couple of Kratky method systems take care of themselves in the meantime.

It's Effective: Since it was discovered in 1993, the Kratky method has been the subject of much interest for Kratky and the University of Hawaii. That has to be good news for those interested in it. It means that the Kratky system has undergone a considerable amount of testing and research. The goal with a new system like the one

that Kratky discovered isn’t simply to work; it is to work well. To that end, the Kratky method delivers. Not only did Kratky find the easiest method, but his crops continually yielded up to 24% more growth. Tests continue to be conducted to see which hydroponic method is the most effec- tive, and time and time again, Kratky wins out. For those plants that take to the Kratky method, it is the most effective way.

Time-Effective: The more complicated your hydroponic setup is, the more work it is going to take to keep everything functioning properly. This can eat up a lot of time and energy.

The pieces of a circulating hydroponic system need to be checked at least twice a day, once in the morning and once before bed. If something has gone wrong in the night, then you have to catch it immediately. The Kratky method doesn’t require the same kind of attention. Putting together a Kratky-based system will take a little bit of time, but after that, you can put it to the back of your mind. You’ll still want to check on it from time to time, but you can do this on your schedule rather than the plant’s.

It’s a Great Way to Introduce Kids to Hydroponics and Gardening: Introducing children to gardening is a smart idea. Not only can gardening be a lot of fun, but it’s the one skill that teaches your child how never to go hungry! That said, gardening can be super-messy with a child, and they often don’t have enough sustained attention to provide daily care for a plant over several months. That can make the Kratky method a great way to introduce kids to hydroponic gardening. Building the Kratky system is a hands-on project that lets kids make

something themselves. This keeps them captivated in the fun of the building process, and then produces a sense of pride upon creation. Then, instead of the creeping boredom that comes from having to watch a plant grow slowly, your kids are able to come back to the grow whenever they are interested and see how it is doing. Upon harvest, there is a second sense of pride and joy to be experienced. This makes the Kratky system a terrific way to introduce kids to the best aspects of gardening before building more challenging exercises with larger hydroponic systems or soil-based gardening.

Makes a Fantastic Gift: Getting a plant as a gift is always a really cool experience. On the other hand, if someone isn't adept at keeping a plant alive after receiving it, and if they end up watching it wilt and die - that experience isn't quite as fun for some reason! Plants

that are grown using the Kratky method don’t need input from the person receiving the plant. This makes the Kratky method the single best- growing method for gifting a plant to a person. Plus, with a little bit of cleaning, the system could be used again with new plants, if so desired. For this reason, the Kratky system is a very practical system for those gardeners interested in house plants as well as produce.

Profitable: As discussed, the Kratky method requires a low initial investment. Despite this low starting cost, the Kratky method sees upwards of 24% increased growth in the plants grown this way. If you were to grow lettuce or another such leafy green crop through the Kratky

process, and then sell it rather than eat it, you can easily net a tidy little profit. In a lot of ways, the Kratky technique allows you to make money for almost nothing. A little bit of time planting, a little bit of time harvesting, and a little bit of time selling. You can start with a single container of nutrient solution and scale up the operation at your leisure. Money doesn't grow on trees, but it does sometimes grow in buckets.

It's Beautiful: If you grow your plants in a container or bucket that has see-through sides, you are going to be able to see one of the coolest and most beautiful sights that a gardener can hope to witness. Since the roots of your plants are in water instead of soil, you will be able to see the way that they move and grow. It's a lovely thing that every single plant you've seen is doing, but has been hidden underground. For those that really enjoy gardening, it is a truly wonderful sight.

It’s Clean: The Kratky method is not necessarily the cleanest hydroponic system (as both wick and deep water culture systems are also quite clean), but it certainly is in the top three. There aren’t a lot of messy parts since you don’t need to check on the Kratky system after it is set up, and there is no flowing water. All you will need to clean up is some fallen plant matter, and that only takes a second.

Cons Of The Kratky Method

While it would be wonderful to tell you that there were no cons to using the Kratky method, this wouldn’t be true. It is only fair that you know exactly what limitations this system has, so that you know if it will fit your needs or not.

It is Best Used for Smaller Plants: The larger a plant is, the more nutrients it is going to require. The thing about the Kratky method that makes it so attractive for beginners is that it is a hands-off approach to growing an automatic farm. Larger plants would drink through the solution and need to be filled up more, and they will expand from one size container into needing a much larger one. This makes the Kratky method a poor choice

for the beginner looking to grow large plants. Sticking to smaller plants with the Kratky system will net much better results.

The Roots Need to be Covered: The roots are beautiful and definitely a sight that you want to take in, but that should be on rare occasions. When growing with the Kratky arrangement, it is best to purchase hard plastic containers that block out the light or to cover up see-through containers in a tarp, aluminum foil, or heat resistant blanket. As mentioned, plants typically have their roots below the ground, and this means that the light never actually hits the roots directly. When this happens, the roots could start to grow algae within the water. The algae starts to feed on the nutrient solution itself, and this, in turn, begins to take nutrients away from your plants to feed this intruder. While the roots are one of the most beautiful sights you can see with the Kratky method, it is also somewhat dangerous to do so and better avoided by beginners that aren't careful.

You Need to Triple-Check the Lid is On: The most disappointing experience in the world is to realize that you didn't put the lid on tightly, and now you have algae, insects, or disease living inside your nutrient solution. That is an entire crop gone because the seal wasn't secured properly. The worst part of it? It might take you weeks before you realize that there has been a problem. When working with the Kratky method, you must be extremely cautious during the building phase to make sure that everything is done properly. Sick plants can lead to sick people if you aren't careful.

Only One Chance: Not only is the build your one chance to get everything right with the hardware, but it is your only chance to get everything right with the nutrient solution. There is something called pH level, a number which lets you know if there are too few or too many nutrients in soil or a solution. Plants have a preferred pH level. If they get too little, then they won't grow very big. If they get too many, then they will hurt themselves through what is called nutrient burn. The pH level has to be precisely right. Most hydroponic systems see the water changed throughout a grow period, and this allows for much more efficient control over the pH level during the growth cycle. With the Kratky method, the pH level needs to be right when it is mixed because there is no tinkering with it after the build is done. The system is closed off, and the plants are left to do their own thing. Again, the building phase of the Kratky system is the single most important step, and it has to be done carefully and correctly.

Comparing The Pros To The Cons

The Kratky method has its share of both pros and cons, so weighing the two is an important step each grower should take before beginning to buy the material needed for a setup. By looking at these in comparison, there are a few lessons that stand out and will help you decide if the Kratky method is for you.

Hands down, it is the most cost-effective way of growing small plants. This is the biggest pro that it has going for it but also hides its biggest con. The fact that the Kratky method doesn’t do well with large plants can be a turn-off for many people. Still, many small crops do quite well with the Kratky method, and we will be looking at these in the next chapter.

The ease of maintenance for plants grown using Kratky principles makes it a fantastic choice for beginners, hobbyists, or children interested in gardening. The Kratky method does demand a lot of attention during the building process as mistakes made there will ruin the entire process. This can be discouraging when it happens, but it shouldn’t stop you from trying the Kratky method, it is best taken as a warning to be attentive through the process of building.

If you can give the building phase your attention and want to grow smaller-sized plants in abundance, then the Kratky method is the easiest, most cost-effective, and high-yielding approach that you could pick. With yields up to 24% larger when grown according to this program, it would be a mistake not to choose it for your growing needs.

Chapter Summary

✓ The Kratky method requires very little money to get started growing your own crops. The fact that there is no electricity also helps to keep the overall cost down.

✓ The Kratky method is the easiest hydroponic system to start using. There are no moving parts, everything fits together easily during the build phase, and many crops can be planted and then left alone to grow.

✓ Kratky has done a lot of research on his method and found that his crops continually yielded upwards of 24% more growth. The Kratky method is often listed online as one of the most effective plans for large harvests.

✓ It takes time to build a Kratky method system, but once it is made, there is very little maintenance required to keep it working. Each part of a Kratky system, apart from the nutrient solution itself, can be washed and cleaned for future use.

✓ The ease and the low maintenance required to grow plants with a Kratky system makes it a fantastic way to introduce children to the world of hydroponic gardening.

✓ Kratky systems are self-contained. That makes it a great system to use when gifting a plant to someone else, as it reduces the amount of maintenance the giftee needs to under- take to keep their new plant alive.

✓ With 24% bigger yields and a cheap cost of entry, the Kratky method can be used to turn a profit with ease.

✓ If you use a see-through container, then watching the roots of your plant grow is truly wondrous.

✓ The absence of moving parts and the reduction of maintenance makes the Kratky method one of the cleanest hydroponic systems.

✓ Larger plants won’t take so well to the Kratky method, and so it is best used for smaller plants.

✓ While it is tremendous to see the root system of your plants, you need to cover the nutrient solution to prevent direct light from promoting algae growth in the reservoir.

✓ If the lid on your Kratky system isn’t tightly secured, then harmful bacteria and pathogens can easily enter the system and kill your plants.

✓ Since most Kratky method systems are meant not to be opened again after they are built, you need to be extra careful to get everything mixed properly and tightly secured during the build phase.

✓ The Kratky method is the best approach for beginners looking to grow small plants. Larger plants will require a different system, but the low cost, ease of maintenance, and increased yields make this approach one of the best systems you could build.

In the next chapter, you will learn what plants are best grown with the Kratky method to produce large yields. This will cover both plants suited for beginners, and those that require a little bit more work for those gardeners that like a challenge.

CHAPTER FOUR: THE 10 BEST CROPS TO GROW WITH THE KRATKY METHOD

While this technique is best used for smaller plants, it shouldn’t be thought of as a limitation on the variety of plants that can be grown. In this chapter, we’ll briefly look at ten crops that do fine when grown in the Kratky system. The smaller the plant, the better suited it is for beginners to hydroponic gardening.

Lettuce

Out of all the crops grown using the Kratky system, lettuce is the one that responds the best. The majority of research that has been done focuses on the amazing effect it has on lettuce. Again and again, the Kratky system shows impressive results when it comes to how much produce they yield. Lettuce also grows extremely rapidly in a hydroponic system, which makes it a fast crop for those looking to use this method to earn money. Lettuce likes to be grown in cool places, as too much heat will stunt its growth. It should be provided a pH level of 6.0 to 7.0 when the nutrient solution is mixed during the build phase.

Lettuce is best grown in a container that provides a gallon of nutrient solution per plant. A five-gallon container could be used to grow five heads of lettuce. Lettuce takes best to a growing medium that gets lots of air, such as chunks of coco coir or clay. A nutrient mix for lettuce is evenly balanced, which means that it has equal parts nitrogen, phosphorus, and potassium.

Lettuce is best planted by dropping a few seeds into each pot of growing material that will be cut into the lid of your growing container. As lettuce grows, the strongest seedlings should be supported while weaker seedlings are trimmed away. That does mean there is more maintenance when beginning to grow lettuce, but less as the process evolves. If your ratio of plants to the nutrient solution is one plant per one gallon, then you won’t need to refill the nutrient solution in your hydroponic setup until after you harvest your lettuce and are ready for the next crop.

Spinach

Growing spinach in a hydroponic garden is a fantastic choice. Much like lettuce, spinach grows in larger volumes in a hydroponic system when compared against soil-grown crops. Spinach also grows quickly hydroponically so long as the system used is one that allows plenty of oxygen to get at the roots. Since our method privileges the oxygenation of roots, this makes it the perfect system to grow your spinach.

It only takes spinach about a week to go from seed to seedling, and then forty days later, you can expect to harvest your plants and toss them in a salad. In that time, our system will not need to have its water changed so long as the nutrient solution to plant ratio remains at one plant to one gallon. A pH level between 6.0 and 7.5 is necessary. This pH level is mostly within the ranges that lettuce likes as well, and this means that the two plants can be grown together in a single Kratky system, though lettuce will harvest a week or two earlier than spinach does.

Spinach will take on a different taste depending on the temperature it is grown at. Sticking with a temperature between 65F and 72F will lead to sweeter tasting spinach, but the lower the temperature you grow, the longer it will take the spinach to grow. Provide spinach with plenty of sun and an NPK balanced mixture.

Herbs

A herb garden is a great addition to any house or home. Herbs are most well known for their delicious taste and used in millions of dishes cooked around the world. They are also known for having a wide variety of medical benefits that are released primarily through seeping the plants for their flavor, such as you do when making tea. Growing herbs in a hydroponic system produces more aromatic crops than soil-grown herbs. When you consider how easy it is to set up a Kratky method herb garden, they pretty much become a must.

The biggest issue with growing herbs is the fact that there are upwards of a hundred different kinds. Different species require different pH levels and have longer or shorter growing times, depending on the variety. That said, herbs tend to have small root systems, and that means they can grow in a small system rather than a larger one. Herbs should be researched first to figure out what pH level and amount of light they require. It is also a good idea to research their growth time.

Herbs can be grown much tighter together than lettuce or spinach, and so a ratio of two patches to a gallon of nutrient solution can be used. Hydroponic systems with moving solution require the growing media of your herb garden to be rinsed on a weekly basis, but since the Kratky method doesn’t have any moving water, this isn’t an issue for you. If you’re looking for the tastiest herb in the easiest possible growing arrangement, then the Kratky method is hands down the best way to go.

Bell Peppers

Echoing everything said above about the benefits of growing these plants hydroponically, bell peppers also take enthusiastically to hydroponics, and they tend to have bigger yields. That said, bell peppers are going to require a little more effort to look after when grown hydroponically. The problem is that bell pepper plants like to grow quite tall, and this redirects energy away from the peppers themselves and towards the growth of the foliage. In order to manage this in a hydroponic system, you should plan to use a pair of garden shears to prune the plant and keep it at about eight inches tall. That will keep the energy flowing into the peppers so that they taste amazing.

Bell peppers will take about 90 days after seedlings start to show. During those 90 days, bell peppers require a lot of light, and you can expect to give them a minimum of 18 hours a day. However, bell peppers can actually handle 24 hours of light, and so it is often more effective just to give them a dedicated light that you never shut off. While bell peppers require a pH level between 6.0 and 6.5, making them similar to lettuce and spinach, they should be grown in their own containers. They'll need more nutrient solution to drink, and so grow bell peppers at a ratio of one plant to three gallons of water.

Bell peppers are a terrific crop to plant as you start looking to improve your skills. Beginners are best sticking with herbs, lettuce, or spinach and moving up to bell peppers before trying trickier crops such as tomatoes. Growing bell peppers in our system with the right ratio of nutrient solution won't require any fiddling with the solution, but the necessary pruning gets the beginner checking on their plants more often, and learning how to tend to their needs post-build.

Tomatoes

Tomatoes can be a lot harder to grow in the Kratky method, but that doesn’t mean that they are impossible. In fact, while they will take quite a bit of extra work, tomatoes can actually grow well using the Kratky method of hydroponics. The big thing with tomatoes is that they love getting lots and lots of liquid, and so you will need to mix a new nutrient solution for them on a weekly basis if you don’t use a large enough container.

If you grow a tomato plant in a five-gallon bucket of nutrient solution, then you can expect to have to refill it weekly until your tomato plant finishes growing. If you want to grow a tomato plant without having to refill your Kratky method nutrient reservoir, then you are going to

need to use a container that holds thirty to forty gallons. This makes for a large container, and an extremely heavy one at that, which will almost entirely limit the mobility of the system. If you are willing to mix up a new nutrient solution every week, then a five or ten-gallon bucket will prove a much easier experience. A ten-gallon bucket is especially beneficial as it will be heavy enough to support a trellis, which you should have to control the growth of your tomato plant and give it structural support.

Tomatoes like to get a pH level in the range of 5.5 to 6.5, and a temperature between 60F and 90F, though most growers agree that temperatures at the lower end of this spectrum produce tastier fruit. Like bell peppers, tomatoes need lots of light, and can even benefit from having a dedicated light set up for 24-hour illumination. They'll take two to three months to grow, so you can expect to have to water your tomatoes eight to twelve times during this process. While this makes tomatoes a more involved crop, the results are often well worth the effort.

Strawberries

These delicious guys are best grown indoors when done hydroponically, as they prefer to have very tightly controlled environmental factors. From seedling to harvest is only about 60 days, so they are quick to turn around and enjoy. Strawberries can be grown in any of the hydroponic setups that have been mentioned throughout the book, but the Kratky system can work perfectly fine so long as extra attention is paid to the startup.

Strawberries do well in a deep water culture or wicking, and the Kratky system can be seen as the cousin to these two approaches. The problem with growing strawberries in a Kratky system is entirely pinpointed in the initial building phase. A pH level of 5.5 to 6.2 is necessary, and if this is off, even by a few points, then your strawberries are going to suffer. Getting this just right makes or breaks your crop. A Kratky method system

is also best used for a small crop rather than a large one, and so you can expect to grow three or four plants in a five-gallon Kratky system.

When you are growing strawberries, pay close attention to the climate you create for them. Provide eight to twelve hours of light and keep it on a routine schedule. Pay close attention to your strawberry plants as they grow, since the buds will need to be pollinated by hand. This is done by taking a brush and brushing pollen from the male flowers into the female flowers. This should be done once a day, starting from when flowers begin to open. Provide a temperature between 60F and 80F, with 70F being just perfect. The temperature at night needs to be reduced by a few degrees.

While it’s true that strawberries take more maintenance to grow due to their pollination needs, you shouldn’t need to regularly replace the nutrient solution during the process like you would with a thirstier plant like tomatoes. All the same, you should keep an eye on the level of nutrient solution in your system as some varieties of strawberries are thirstier than others, and may need one or even two nutrient solution refills during their lifecycle.

Bok Choy

A staple of many Asian dishes, bok choy is a delicious and nutritious addition to any hydroponic garden. A little weird to work with, only because not many North American growers have experience with it, bok choy is notable for how rarely pests or diseases attack it. While any plant can be attacked, this rarity makes bok choy a good crop of choice for those gardeners who aren’t able to keep their grow space secure indoors.

Bok choy requires a pH level between 6.0 and 7.5. It doesn’t need a lot of light a day; in fact, it only likes to have six to eight hours. For temperature, grow bok choy between 50F and 70F. While this temperature is for the room that the bok choy grows in, most hydroponic systems will require extra attention to ensure that the nutrient solution doesn’t get too hot. That’s because a nutrient solution at a higher temperature, then this will make it impossible for the roots to get enough air. However, since the Kratky system is developed to provide plenty of oxygen as the nutrient solution is used up, this won’t be a problem in your setup.

It takes about a week for bok choy seeds to germinate, and then two to four months for them to be ready to harvest. Follow the one plant to one-gallon ratio of lettuce and spinach when growing bok choy. If you are working with a five-gallon container for your system, then only grow four plants rather than five to be on the safe side. This habit of leaving a little wriggle room is a smart idea regardless of the crop you are growing, but especially so with bok choy since there can be a fair bit of variation in the size of the plants and how quickly they absorb the nutrient solution.

Celery

Much like bell peppers, celery makes an excellent crop for beginners looking to expand their skill set and tackle harder crops. A source of vitamins and plenty of healthy fiber, a crop of celery is going to take some time and dedication. With a longer growing time than any of the other crops we've looked at, you can expect celery to take almost 150 days before it is ready to harvest. This makes raising celery a longer project than most, which is one of the reasons it is best for those looking to move beyond the beginner stage.

Celery grows when it has a pH level of 6.5. Many plants will grow just as long as their pH level is within a set range, but celery is very particular about its pH level. This requires careful attention paid to the nutrient solution mixed during the build phase. While growing, a

temperature between 60F and 75F is required and at least six hours of light. Celery is a low to neutral light crop, and so anywhere between six to twelve hours of light will keep it healthy. Use a growing medium like clay pebbles, which allows for plenty of oxygen to get at the roots. This isn’t as important the older the plant gets, as its roots will get plenty of oxygen in a Kratky system, but young plants will benefit this way greatly.

Celery should be grown at a ratio of one plant to two gallons of water. Following this, a five-gallon container would raise two celery plants, and a ten-gallon nutrient reservoir can grow four so that there is some wiggle room left. Celery will benefit from an NPK balanced solution with calcium, magnesium, and humic acid added to improve the quality of stalk and the speed of nutrient uptake.

Cucumbers

Cucumbers are an ideal crop for a Kratky method, and, when grown hydroponically, they have a tendency to be much crisper. This makes every bite of a hydroponically grown cucumber a treat. However, since cucumbers are mostly made of water, they require an absolute ton of it. Not as much as tomatoes perhaps, but enough to be of note. You can expect most varieties of cucumber to grow at a ratio of one plant per four gallons of nutrient solution. What that means is you can grow one cucumber plant in a five-gallon container or two in a ten-gallon reservoir.

Cucumbers love to get lots of air, and even though the Kratky system provides this for them, some Kratky method gardeners purchase and add an airstone to their reservoirs. Doing this isn’t necessary, and it requires a more considerable investment, and then the addition of electricity to work. A cheaper approach is to use a very breathable growing medium to allow lots of air to younger plants and allow the roots to get oxygen through the natural manner of a Kratky system.

A pH level of 5.5 to 6.5, and a temperature between 65F and 75F, will suit your cucumbers just fine. However, a trellis will need to be set up to offer support to your cucumber plants as they fruit and grow, since cucumbers are quite top-heavy. Cucumber plants are self-pollinating, and so, given enough nutrient solution, light, and a trellis to support their weight, they will be more than happy to start growing. You can expect to be harvesting and eating them in fifty to seventy days.

House Plants

Just because hydroponic gardening is primarily used by growers who are after crops of vegetables, herbs, or fruits, this shouldn’t be taken to imply that this is all it is used for. One of the reasons that the Kratky method is such a cool system is the mostly hands-free approach it offers growers. As mentioned in the last chapter, this makes a Kratky system a great way to give a plant as a gift. While you may want to give someone their own lettuce or spinach plant, a house plant is a more commonly exchanged gift, and there are a large number of them that work well in a Kratky method system.

Every house plant is going to have different needs as far as light, pH level of their nutrient solution, and the size of the container they’re to be grown in, and this will require further research. Still, a brief consideration of some of the varieties that take well to the Kratky method might spark a few ideas in your head. Try to grow: devil’s ivy, spider plants, philodendrons, peace lilies, female dragons, Chinese evergreens, leopard lilies, Chinese money plants, and arrowhead vines.

When carefully put together, a small Kratky method system can allow you to set your house plants and forget about them. However, house plants typically are expected to be around longer than harvest crops, and so regular refilling of the nutrient solution will be required to keep them alive. Smaller plants can fit into smaller containers, and you shouldn’t ever need to use something bigger than a gallon or two, so refilling these Kratky systems should be quick and easy. Thanks to their

low weight, you can do your maintenance on these systems over your kitchen sink, so you don’t need to worry about spills or messes.

Chapter Summary

✓ When it comes to crops grown in the Kratky method, lettuce has had the most research conducted. It produces huge yields, with minimal maintenance. Provide a pH level of 6.0 to 7.0, and a ratio of one gallon nutrient solution per plant.

✓ Spinach is another crop that grows well in Kratky with minimal maintenance. Provide a pH level of 6.0 to 7.5, a temperature between 65F and 72F. A lower temperature will produce sweeter tasting spinach.

✓ When herbs are grown in a hydroponic system, they produce more aromatic crops. Herbs can be much more tightly grown compared to any other crop.

✓ Bell peppers grow large yields in hydroponic systems, though they require extra attention when it comes to pruning and a minimum of 18 hours of light a day. Provide a pH level between 6.0 and 6.5, and a ratio of three gallons of nutrient solution for each plant.

✓ Tomatoes need a pH level between 5.5 and 6.5, a temperature between 60F and 90F, and upwards of 24 hours of light. They will also need to be provided with plenty of nutrient solution refills because they are especially thirsty plants.

✓ Strawberries require a pH level between 5.5 and 6.2, eight to twelve hours of light, a temperature between 60F and 80F, and manual pollination.

✓ Provide bok choy with a pH level between 6.0 and 7.5, temperature between 50F and 70F, but only six to eight hours of light a day. Follow the one gallon per plant ratio.

✓ Celery is one of the longest growing crops you can raise in the Kratky method and needs a pH level of 6.5 exactly. The temperature can range from 60F to 75F, and added calcium, magnesium, and humic acid can improve the speed they absorb nutrients.

✓ Cucumbers will need to have a trellis to support thei r weight, a pH level between 5.5, and 6.5, temperature between 65F and 75F, and lots of space. One cucumber plant needs four gallons of nutrient solution for itself.

✓ House plants benefit from the Kratky system since it takes care of watering them for you. That said, house plants are typically expected to last several years, and this means you will be refilling the nutrient solution at regular intervals.

In the next chapter, you will learn what equipment you need to build a Kratky system. You'll also learn what equipment you need to properly harvest and tend to your plants as the need may arise. By the end of the chapter, you will have put together a shopping list for all the items you need to get started growing with the Kratky method.

CHAPTER FIVE: THE EQUIPMENT REQUIRED FOR THE KRATKY METHOD

Now that you know why the Kratky method is the best choice for beginners, and you've seen what kinds of crops you can grow using it, it is about time to start turning your attention towards making your own Kratky system.

In order to make your own arrangement, you will first need to purchase the necessary equipment to put it together and maintain it. In this chapter, you will learn precisely what pieces you need, and where you can buy them. We will first look at each piece so that you understand why it is essential, and then the chapter will close out with a checklist so you can be sure you have everything that you need and aren't missing anything.

The Hardware

If you are going to make a Kratky method hydroponic system, then you are going to need the container and the other parts of the physical hardware. We'll look at these here before turning our attention over to the interchangeable parts like nutrients and growing media. We will close out by looking at tools.

A Container for the Nutrient Solution: The size of the container you get is going to reflect the kinds of plants that you will be able to grow, as well as how many of them you can comfortably fit. This allows you plenty of flexibility in choosing the container for your first Kratky method system.

While you can pick any material, you want for your container, beginners would be best served by sticking with a hard opaque plastic. Try to go with a light grey or white color instead of black. The reason to pick plastic and avoid black is to reduce how much heat the container absorbs. A metal container or a black container will hold on to more heat and raise the temperature of the nutrient solution in your system. An opaque plastic will prevent sunlight from getting at the roots and promoting algae growth.

A container of this kind can be found online through Amazon, and can also be obtained at your nearest Walmart or hardware store for between $10 to $20. If the container does not come with a lid, then a fitted one should be purchased alongside the container.

Net Cups: Made out of cheap plastic, net cups have plenty of holes in them to let the roots of your plants grow out of. They look exactly like your typical plastic plant pot apart from all those extra holes. The holes are small enough to hold in the growing medium, but there are enough of them to ensure that roots have no problems getting to the nutrient solution housed below.

You can find net cups at your local gardening center or in chains like Walmart. For those that shop online, you can purchase 40 to 50 net cups from Amazon for under $15, or even under $10 if you look carefully. These pots should be considered expendable, and you shouldn’t feel bad if you break a few of them when making your first Kratky method system.

Fan: While the Kratky system doesn’t necessarily need the addition of a fan, it can be a useful idea to set one up anyway. The airflow from a fan is very healthy for plants, mainly when they are grown indoors. However, a fan also helps to serve as a measure of pest control as it makes it harder for flying pests to land on your plants. This simple method can help you to some extent in avoiding a drawn-out infestation.

Fans can be purchased in many grocery stores and are always stocked in Walmarts, Targets, and hardware stores. Amazon has a selection of fans starting as low as $15. You don’t need any fancy settings; you simply need to move air through an area. This is an optional purchase, but one that most growers would be wise to invest in.

LED Lights: If you are using your Kratky method system to grow plants indoors, then you are going to need to supply them with plenty of light. Lights range from warm to cool, as noted by the K number on their label. The lower the number is, the warmer the light is. So 2000K would be really warm, and 6500K would be quite cool. Most plants will want 6500K to help them grow their foliage, and 3000K to help them with flowering and producing their fruit.

There are three types of lights most often used by indoor gardeners. These are fluorescent grow lights, LED grow lights, and HID grow lights. Fluorescent grow lights are the cheapest to purchase, but it is worth investing the extra money into getting a set of LED lights. LED lights last upwards of five times longer than fluorescents, and they use half as much electricity. HID grow lights are powerful and best used for large gardens, but they are the most expensive, and they consume the most electricity. You would also need to purchase two kinds of HID lights and know when to use which type.

Most LED lights that you find in stores like Walmart are designed to provide you with light, not your plants. Your plants will need an LED light that has been designed to support them. Your best bet is to purchase from Amazon. The King Plus 1000W LED grow light will cost you about $120 to buy, but the longer life and reduced electricity consumption will save you this much within the first six months of use alone.

Pest Proof Netting: If you are growing indoors, then you may want to invest in a grow tent or a mesh netting to hang up and prevent pests from gaining easy access to your plants. If your hydroponic system is kept in a room of its own, then you can purchase Alpine Reach garden mesh netting to keep your plants safe. For $25 from Amazon, this mesh can be hung around your plants to make it harder for pests to reach your plants.

AlpineReach garden mesh can be used on Kratky method systems that are kept outside, but for maximum protection, you will need to use a garden cover such as the Tierra Garden 50-5010 cover, which you can get from Amazon for $40. Adding a little physical protection will

help to reduce the frequency of pests, and they can be reused again and again until they are ripped or otherwise damaged.

Interchangeable Parts

The hardware mentioned above will let you put together your system, but unless you have the components necessary to mix the nutrient solution and keep your plants in place while they grow, then you aren't going to be able to use your system. When you purchase these, you will have everything you need to start growing, but the tools we look at next will make the experience a thousand times quicker and more effective.

Growing Medium: Plants grown using the Kratky method of hydroponics should be grown in an inert medium. Simply put, this is a type of growing medium that doesn't have any nutrients in it naturally. When you grow plants in soil, the soil itself is a source of the nutrients they need. A hydroponic system uses a water-based nutrient solution to provide these elements, and so the growing medium mustn't have any nutrients of its own. Too many nutrients can hurt plants through a process called nutrient burn. So, always stick to inert growing media.

Every grower you encounter will have their own opinion about what the best medium is. The Kratky method generally functions best when it uses either rockwool, hydroton, or coconut coir. Rockwool (pictured above) is made out of basaltic rock that has been spun into fine fibers and then packed together into cubes or blocks. Hydroton is made out of expanded clay pebbles. Coconut coir is made out of the shells of coconuts and is most often found packed together like rockwool. Using one of these three growing mediums is recommended because they come in larger sizes than many of the others. The large size prevents the growing medium from spilling out of the holes in the net pots that the Kratky method uses. Using one of these will also help to keep your Kratky method system cleaner.

You can find these growing media on Amazon. Expect to pay between $20 and $30 for five pounds of the medium of your choice. You can also find these growing media at your local garden center. Considering the weight of shipping a growing medium, shopping locally might well be the cheapest and best solution.

Nutrients: Nutrients are packaged in two ways. You can buy bags of nutrients that dissolve into water, or you can purchase nutrients in a liquid form that you then just mix together. Regardless of which you end up going with, there are three key nutrients that your plants use. These are nitrogen, potassium, and phosphorus, and together they are referred to as NPK. Mixing equal parts nitrogen, potassium, and phosphorus creates an NPK balanced solution to feed your plants.

You can find nutrients for hydroponic systems at your local garden center. One brand which is recommended often is the General Hydroponics line of nutrients. General Hydroponics makes a three-in-one package that comes with their formulated FloraGro, FloraMicro, and

FloraBloom mixtures. Following the directions on these packages tells you exactly how much to mix to make your nutrient solution. A little more goes into making the perfect nutrient solution, but we'll come on to that in Chapter Seven. For now, you can pick up a General Hydroponics three-in-one package from Amazon for $35.

Water: You should have plenty of access to water, and it is appropriate to consider it here. Tap water will work well enough, but it should be noted that it will have its own minerals mixed throughout it. Distilled water is the best pick when available, though this will cost you more money to purchase from your local grocery store. For the time being, stick with tap water. As you mix your nutrient solution, you will need to pay close attention to the pH level to make sure everything is perfect and that your tap water isn't spiking the numbers.

pH Control Kit: When it comes to mixing that nutrient solu- tion, your water probably isn't going to be enough to increase or decrease the pH level drastically. This is especially true when you use distilled water. As you saw in the last chapter, each crop has a pH level. It needs to stay healthy. Most nutrient solutions are going to be too high or too low after first being mixed. For that, a pH control kit is used to fine- tune the solution.

If you have gone with the General Hydroponics kit for your nutrients, then you might as well stick with them and get their pH Up and pH Down kit. This kit comes as a bottle of pH up, a bottle of pH Down, a small bottle of pH Test Indicator, and a small container for mixing. Fill up the empty vial with some of your nutrient solution, and add a few drops of the pH Test Indicator. The color of the liquid will change and using the scale that General

Hydroponics provides you with, you will be able to tell the range of your mixture. Follow the directions to increase or decrease the pH level as needed. Grab this kit off Amazon for $25.

Neem Oil: Neem oil (pictured above) is found in a lot of household items, ranging from soaps and shampoos to tooth-paste and beauty products. However, you are going to want to buy pure neem oil for use in your hydroponic garden. Neem oil is made up of a lot of different components that together work as a form of all-natural pesticide. You can find a 16 oz container of pure neem oil for under $20 on Amazon, and your local gardening center is sure to carry some. You should also purchase a spray bottle while you are thinking about neem oil. Your local garden center will have spray bottles, but you can save a few dollars by going to a dollar store and getting one there.

Distill neem oil into some water and fill up the spray bottle. Once a week, spray down your plants with this neem oil + water solution. Make sure to get it over the leaves and the plants themselves. This creates a coating that doesn’t harm the plants, but it makes them repellent to pests. If you find that you do have to deal with an infestation, then neem oil works as a part of a treatment routine, but it should already be a part of your weekly routine as a preventative measure.

Tools

The following tools will make your life a thousand times easier as you work with your Kratky method hydroponic system. You could probably get by without one or two of these, but each of them will be used frequently enough to be worth the investment.

Cutting Tool, Gloves, and Markers: You are going to need to cut a few holes into the lid of your container so that the net pots you purchased can properly hang down. This is done by setting a net pot on the lid and then using a marker to outline the hole you are going to cut. Remember to cut on the inside of the circle you draw rather than the outside. It should be a snug fit to get the net pot in place, but once it is, you shouldn't have any worries about it being knocked loose.

Anything that can cut through the plastic of the lid will do perfectly fine here. A set of Nicpro precision cutters costs $14 on Amazon, and comes with three knives and more than 120 replacement and alternatively sized heads. This set will give you the right cutting tool for the job, and plenty of replace- ment blades in case something goes wrong. These are known as hobby knives and are used in model making and wood carving, making them perfect for cutting through plastic. You may be able to find these in a store like Walmart, but your best bet is to check out hobby shops like Michaels.

Because cutting is always a dangerous process, even when safety precautions are taken, make sure you always wear gloves when handling a blade. A good pair

of work gloves from a brand like Ironclad or CLC Custom Leathercraft will run $15 or $20, and they will keep your fingers safe. These gloves can (and should) be used for other tasks around the house that require protection, such as working with wood or metal.

Shears and Spade: It is definitely desirable to be able to cut away any infected or dying parts of your plants. You will also want to trim them to remove weaker seedlings that are sapping energy from your healthier plants. While there are many kinds of shears available online, or at your local garden center, or in department stores like Walmart, I think that these shears aren't as useful as a good pair of bonsai shears.

Bonsai gardening is a form of raising a small tree. What that means is that the shears used for bonsai gardening are designed to be able to clip through a tree trunk deftly. Of course, bonsai trees don't have trunks anywhere the size of the trees outside your window right now, but the texture of a small tree trunk is still harder than the stem of anything that your hydroponically grown plants will ever be. A good pair of bonsai shears such as Wakashishi's 180mm design or Gonick's 7.3" make will cost you $15 to $20 on Amazon, but they will be top of the line in terms of quality.

Since these shears are designed for harder material, they will slice through your plants like butter. This is useful because it means you shouldn't have to make any cut more than once. A single snip with a pair of bonsai shears hurts your plant much less than two or more snips with weaker shears. Your plants are alive, and they feel pain. Too much pain, and they can die. Every time you trim a plant, you are causing it a little shock of pain. By

using sharp shears that get the job done in a single cut, you don’t need to hurt your plant as much, and this leads to a healthier garden.

Since the Kratky method works by using small net pots, you aren’t going to need to dig huge holes. But seeding and trans- planting can be made much easier by purchasing a small spade. Find one at your local garden center or Walmart, or buy one from Amazon for under $10.

EC Reader: When checking the level of the nutrients in your solution, an EC reader is the way to go. This measures the electrical conductivity of the nutrient solution to let you know how well the solution transmits electricity. Since nutrients dissolve in water, they become ions. The more ions, the more conductive a solution is. We use an EC reader to make sure that the solution is kept in the proper ranges.

An EC reader like the HoneForest brand TDS, EC, and temper- ature reader will run you $15 on Amazon, but its unlimited uses and built-in thermometer make it an absolute steal.

pH Test Kit or Reader: You can purchase a set of pH test strips for $10 off Amazon. These allow you to check the pH level of your nutrient solution by seeing what color the strip changes to. Similar to the pH Test Indicator of the last section, these are important to have on hand, but they can start to get costly if you have a lot of checks to do. Replacing the pH Test Indicator or your pH stripes could easily run you $50 or more in the course of a year.

A better investment is to purchase a digital pH reader. Amazon sells a KETOTEK digital pH meter for $15, and the VIVOSUN pH meter with TDS meter combination sells for $20. But despite the higher price tag, the Dr. Meter pH100-V that Amazon sells is easily one of the best pH readers on the market for hydroponic gardeners. At $40, it costs twice as much, but it comes with easy to use instructions, automatic calibration, and offers pinpoint accuracy. Investing in a digital pH reader means never running out of test strips or purchasing more pH Test Indicator ever again.

Must-Have Checklist

- A container for your nutrient solution (opaque plastique)
- A lid for your nutrient solution container Net cups
- LED grow lights
- Growing medium (rock wool, hydroton, coconut noir)
- Nutrient mix (such as Hydroponic Solution’s three-in-one set)
- pH control kit (such as Hydroponic Solution’s pH Up/Down set)
- Neem oil Tap water Cutting tool Gloves Spad
- Bonsai shears Marker
- pH test kits EC reader

Optional Checklist

- A fan
- Electronic pH reader
- Pest proof netting or garden cover Distilled water

Chapter Summary

✓ Use an opaque plastic container to prevent light from entering and promoting algae growth, and to keep the heat of the nutrient solution down when in the light.

✓ Net cups have plenty of holes for roots to spill out while holding in the growing media.

✓ A fan will help to protect against pests and will keep plenty of airflow over your plants.

✓ LED lights cost a little bit more when first purchasing, but they use less electricity and need to be replaced far less often than alternative designs.

✓ Pest proof netting can be added to a hydroponic garden to make it more difficult for pests to infiltrate and infest the system.

✓ The best growing medium is a large, inert material like rockwool, hydroton, or coconut coir. This lets the roots breathe, but is thick enough to stay in the net pots.

✓ You can mix nutrients yourself, but beginners should purchase a balanced kit like General Hydroponics three in one package of FloraGro, FloraMicro, and FloraBloom.

✓ Tap water works in a hydroponic system so long as it is not contaminated.

✓ Use a pH control kit like General Hydroponics' pH Up and pH down to fine-tune the pH level of your nutrient solution as needed.

✓ Neem oil is a natural pesticide that doesn't harm you or your plants but will help to prevent the problem of pests making a meal of your plants.

✓ A tool that can cut plastic, such as a precision cutter or hobby knife is necessary to build your system. Purchase gloves to keep yourself safe and a marker to keep track of where to cut.

✓ The best shears to use are bonsai cutters, which are designed to cut through a tree trunk. A spade for digging and transplanting is beneficial.

✓ An EC reader is necessary to make sure your nutrient solution isn’t too strong or too weak.

✓ Get a pH reader to check the pH level of your nutrient solution efficiently and fine-tune it using pH Up/Down.

In the next chapter, you will learn what precisely steps you need to take to put together a Kratky system and start growing your first plant from seed to harvest.

CHAPTER SIX: SETTING UP AND BUILDING THE SYSTEM

With everything you need already to hand, it is time to put together your Kratky method hydroponic system. In this chapter, you will learn how to put it together in a few short steps, and you'll even learn a couple of tricks that should make seeding easier. But first, you have to decide where to set up your new system.

Ideal Locations

Each Kratky system should be placed depending on the needs of the plants you are growing in it. This will help you to determine how much light the location needs. If you are growing tomatoes, then you will want an area with as much light as possible. Bok choy, on the other hand, will want a location with much less. Outdoor gardeners will need to pick their areas by watching how much direct and how much shaded sunlight the spot gets throughout the day.

Indoor gardeners will have a much simpler time finding the perfect spot. Since indoor gardeners can use electric lights to control the amount of light their plants get, a

Kratky method system can be placed pretty much anywhere indoors.

Another factor to pay attention to is the heat of the location. Outdoor gardeners should check the temperature of the spots they are considering to see how it changes throughout the day. A good idea is to check the temperature of the spot once an hour, beginning when you wake up and finishing just before bed. This will let you know the kind of natural fluctuation there are. Again, indoor gardeners will have fewer factors to consider in controlling their climates.

Working out the amount of light and the temperature of a space, will give you what you need to ensure that the plants in your Kratky method system are in an environment that’s ideally suited to their growth.

However, one more concern that you need to keep in mind is that of security.

Indoor gardeners will be able to create a stronger level of security around their gardens to prevent pests from entering.

It is a smart idea to position your plants in a location with less foot traffic to prevent the risk of biological contaminants being introduced. A room or closet dedicated to growing is best in this regard. Outdoor gardeners will not be able to provide security at quite the same level, but keeping your system protected from the wind can help with reducing threats.

While security is primary, it should be secondary to ensuring that the location you pick has the right combination of temperature and sunlight. Those two elements are crucial to creating a healthy and productive garden.

Building Your First Kratky Method Hydroponic System

To build your Kratky method hydroponic system is very straightforward. A little bit of hard work at the beginning is necessary to prepare all of the pieces. However, once fullfilled, all you need to do is slot everything together and mix it up. Let’s begin by creating the top part in which our plants rest.

Putting Together The Lid

Step 1: Place the lid of your nutrient solution container on a solid surface. Space out the net pots you are going to use so that they are evenly distributed. Take a marker and trace around the net pots, so you know where to cut your holes.

Step 2: Put on your safety gloves and use your cutting tool to cut holes into the lid. Each hole should be cut on the inside of the circles you marked. Doing this will keep the seal firm and tight and reduce the chances of your net pots falling into the nutrient solution. Use your cutting instrument at a 45-degree angle along the inside rim of the hole to make it smoother. You may want to use a piece of sandpaper to even out the cut and remove any pieces sticking out.

Step 3: Secure your net pots by slotting them into the newly-cut holes. The holes should be just the slightest bit smaller than your pots so that you need to force them into place. This should have an effect of getting tighter the further in the net pot goes until it is all the way in and held firmly. Repeat this until every hole has been filled. Keep your gloves on during this step in case a net pot breaks and creates sharp points.

Step 4: With all of the net pots in place, pick up the lid and attach it back onto the nutrient solution reservoir. The reservoir should be empty and dry during this stage. Ensure that the lid snaps on properly and that there are no problems due to your alterations. Use your marker to quickly note how far into the reservoir the net pots hang.

Double-check that the net pots are tightly secured in their holes and that the edges of their top lips are pressed tightly against the container lid.

Step 5: If everything is in place, then you are ready to move on to mixing your nutrient solution. Before you do so, remove the lid and place it to the side for the time being.

Mixing The Nutrient Solution

Step 1: Regardless of whether or not you just purchased the container you are going to use for your nutrient reservoir, or you are reusing one you already own, the first thing you are going to want to do is to give it a thorough wash. This is to remove any chemicals or harmful bacteria that may be adhering to it.

Step 2: Once you have cleaned your reservoir, you are going to fill it with water. You marked on the side of the container how far down the net pots hang into the container. Use this marking as your fill guide. Fill up the container so that the water rests just beneath this line.

Step 3: Start mixing the nutrients you purchased into the mixture. Each bottle of General Hydroponics comes with directions on how much to use when mixing your nutrient solution. As the best solution is a balanced one, aim for equal parts of each solution. If you have selected a solution that isn't mixed in equal volumes, then you are going to need to follow the directions on the package to determine the volume necessary. Mixing these in will raise the water level so that it's even with your previously noted marking.

Step 4: Stir everything together for a minute or two and then check the pH level of the water using either pH Test Indicator, a pH strip, or your electronic pH meter. No one size fits all pH levels when it comes to gardening, and so you need to know what pH level is required for the plants you wish to raise. If the pH level is where you want it to be, then skip the next stage.

Step 5: Mix in, either pH Up or pH Down, to get your desired level. Check the instructions on the package for more information about volume and safety instructions. Regardless of the amount listed on the package, always start by adding less than recommended. You do this so you can mix it together and take another pH reading before adding more. You can always mix in extra, but you can’t take any of it out if you used too much.

Step 6: Use your EC reader to check the mS/cm reading for your solution (more about this in the next Chapter). Add more nutrients to increase a low reading. Add more water to lower a high reading. Confirm that your mS/cm levels to finish preparing your nutrient solution.

Preparing Seeds

Growing plants from seeds isn’t hard using a Kratky method hydroponic system. Instead of transplanting seedlings into your trays, you will instead be using rock wool cubes to help the seeds germinate.

Take out a few rockwool cubes, dip them into some water, and then use your finger to dig a little hole into each. Drop a couple of seeds into this hole, then gently cover it over. Place each cube into one of the net pots (prior to filling it with a growing medium). The rockwool cubes must start moist throughout the germination period; otherwise the seeds won’t properly grow into

plants. If everything has worked as it should, then the seeds should germinate in a few days, and roots will start to poke out through the holes of the net pot to begin drinking the nutrient solution below.

Please note that a lot of these factors change based on the species you are growing. Some plants, like succulents, for example, don’t grow well when covered by a growing medium. Seeds like these like to be spread out on the surface of the medium and left to do their own thing. Other types of seeds will want to be planted in a deeper or a more shallow hole. Some seeds will take a couple of days to germinate, and some can take upwards of two months.

When considering what type of plants to grow, pay attention to whether or not it has a soft seed or a hard seed. Seeds that have hard shells need extra work to germinate. There are three methods commonly used to do this. One is to use sand- paper or a carefully applied blade to make the shell thinner. Another way is to soak the seeds in water overnight. If you soak your seeds, throw out any that float as this is a sign that they are a dud. The final method for hard-shell germination involves soaking and then storing the seeds in a fridge for several months. None of the crops we looked at in Chapter Four are hard-shelled, and so you should practice on soft-shelled seeds first.

As long as you keep your rockwool moist, you should have no problem germinating a soft-shelled seed. Since you plant several at a time for each rockwool cube, pay close attention to the seedlings that sprout, and be ready to remove the weaker ones. It might seem weird to toss out plants you only recently started growing, but the extra room to grow will encourage your stronger plants. That means you produce the most impressive plants possible.

The Final Steps

If you followed the steps listed above, then you should have a solid Kratky system in place. This might be the last step you need to take, depending on where you set up the system, but the chances are you still need to consider the growing environment.

Plug in and aim any grow lights that your plants need. Turn on your fan if you have one, too.

Once everything is in place, it is a good idea to take note of the time and day. Grow lights need to be on for a set time every day, and neem oil should be applied on a weekly basis. Taking notes and writing down dates and scheduling maintenance should be the final step you take whenever you work in your garden. Doing this saves you from forgetting or misremembering the significant dates, and it creates a guideline that others can follow, just in case you have to be away from home, or if you’re sick. Having these back-up notes is a safety precaution that all gardeners should take.

Chapter Summary

✓ Indoor gardeners can control the amount of light their plants get, removing the need to consider the position of the sun when picking a location to grow. The best spot for an indoor grower is an area with less foot traffic. A closet or grow room that can be closed off to the public is ideal.

✓ Outdoor gardeners need to consider how much direct sunlight a location gets, as well as the range of temperatures a space runs. Outdoor gardeners don't have as many options to prevent pests, but some protection from the wind can help in reducing pests' access to your Kratky system.

✓ Build your Kratky system by first cutting holes in the lid for the net pots to hang. Smooth out the holes, slot the net pots into place firmly, and double-check that the lid still tightly fits the nutrient solution reservoir.

✓ Next, mix the nutrient solution by washing the reservoir, filling it up with water, and mixing in the nutrients by following the directions on the package. Stir everything together, check the pH level, and add pH Up or pH Down, as needed. Check the mS/cm level of the nutrient solution using your EC reader, and dilute or strengthen the solution by adding more water or more nutrients.

✓ Hard-shelled seeds will require extra work to start the germination process, but most crops that grow in a Kratky system will be soft-shelled. Drop some seeds into a rockwool cube, and put the rockwool cube into the net pots. Ensure that it remains moist so the seeds can begin to germinate.

✓ Put the lid on the Kratky system with the plants in the net pots. Organize any necessary lights. Take note of when everything was started to create a maintenance schedule for things like neem oil applications.

In the next chapter, you will learn all about what goes into mixing the perfect nutrient solution for your plants. You'll learn what uptake is, and why you want optimum intake when it comes to the nutrients your plants are using. You'll also learn why we use the growing media that we do.

CHAPTER SEVEN: NUTRIENT SOLUTION AND GROWING MEDIA

When you grow your plants in the ground, nutrients come from the soil itself and from the fertilizer or compost that the gardener adds to the plant beds. Hydroponic gardens deliver nutrients through the liquid solution in the reservoir. In this chapter, you'll learn how plants 'uptake' these nutrients, what those nutrients are, and tips for getting the optimum concentration.

Understanding Nutrient Uptake And Nutrient Solution Tips

Plants need nutrients just as much as you or I do. But just like you or I, plants can be overfed or underfed. Understanding the way that your plants get their nutrients will help you to understand their needs so that you can adequately tend to them.

Nutrients come in two forms. Macronutrients are the larger building blocks that your plants need. These can be nitrogen, phosphorus, and potassium; they're primarily mixed to create your nutrient solution. There are also micronutrients like boron and chlorine, which different species may need in larger or smaller amounts.

For your plants to be able to uptake nutrients, they must first be dissolved in water. While you can easily see how this occurs in a hydroponic system, it might seem odd when traditionally-grown plants get nutrients from the soil. However, you need to water your plants, and it is this action that allows the nutrients in the soil to be dissolved enough for the plants to make use of them.

The roots of the plant suck in the nutrients, and then the vascular tissue pulls the nutrients up the stem and pushes it out through the leaves. All plants have tiny pores (or stomata) covering their leaves, which release water vapors. This release creates a negative pressure inside the leaves of the plant, which helps in pulling water throughout the plant. This, in turn, ensures that

nutrients are spread out through the plant as they have been dissolved in the water.

Different nutrients are absorbed at different rates. Likewise, different species require different concentrations of these nutrients. For example, tomatoes like a mixture of 190mg/l nitrogen, 40mg/i phosphorus, 310mg/l potassium, 150mg/l calcium, and 45mg/l magnesium. Nitrogen is a fast- absorbing nutrient, while potassium takes between ten to twelve times longer, and phosphorus takes forty-eight to ninety times longer than nitrogen.

The interplay between these absorption rates primarily comes into play when first mixing your nutrient solution. Since most Kratky crops use a single nutrient solution to go from seed to harvest, the nutrients are mixed at the

appropriate ratio and then left alone. When using a preformulated nutrient solution, such as the General Hydroponics nutrients suggested above, simply follow the instructions on the packaging. This is the best approach for new gardeners.

Those growers who are looking to mix their own nutrient solution from raw ingredients need to be mindful of the quantities involved. Tomatoes prefer a lot of nitrogen. Straw- berries, however, only like to have 50mg/l, which is only a fourth of the tomato plant's requirements. So, the strength of the tomato plant solution would be harmful to a strawberry plant. Carefully study the needs of your plants before mixing your own nutrient solution.

When making a nutrient solution from raw materials, use multiple containers for each step. Use one container to mix together your macronutrients, and a separate container for mixing the smaller traces of micronutrients. When each of these has been correctly balanced, then put them together with the water for your nutrient solution. Check the pH level and adjust accordingly.

A Look At Plant Nutrients And Fertilizer

There are three groups of nutrients to be discussed when considering what to feed your plants. There are primary macronutrients, which will be mixed in the largest quantities and which make up the majority of your nutrient solution (aside from the water). Secondary macronutrients are also important to your plants but are needed in much smaller doses than primary macronutrients. Then there are micronutrients which your plants do need, but only in small amounts. A properly formulated nutrient mixture such as that from General Hydroponics will include all thirteen of these

macro and micronutrients. It is these thirteen mineral nutrients that are used to make up fertilizer.

The role of fertilizer in traditional gardening is not to feed your plants directly, despite what you may think. Fertilizer is actually used to protect the microorganisms which live in the soil that your plants are growing in. These microorganisms are an essential part of keeping your plants growing properly, and they, in turn, help to break down nutrients in the soil and the fertilizer so that it is easier for the plants to use them.

A hydroponic system doesn’t use soil. In your Kratky method system, you are using an inert growing medium. This means that it doesn’t have intrinsic nutrients. Nor are there microorganisms that need to be cared for. The nutrients are in the liquid solution, and the roots of the plant can uptake them readily. The nutrient solution, for all intents and purposes, replaces the need for fertilizer in a hydroponic system. Fertilizers are mixed in low concentrations so that they protect rather than harm the microorganisms in the soil. Hydroponic nutrient solutions are mixed much stronger since there are no microorganisms to protect, but the solution provides all the necessary nutrients that fertilizer would normally deliver. Thus, you don’t need to fertilize a hydroponic system.

Returning to the nutrients your plants need, we have left out three nutrients; these aren’t found through minerals. Oxygen, hydrogen, and carbon are all necessary building blocks to produce big and healthy plants. Oxygen and carbon are both pulled out from the air itself, and this is why a breathable growing medium or soil is often used in gardening. The Kratky method allows the roots of its

plants to be exposed to the open air inside the system, and so this provides oxygen and carbon easily. Hydrogen is simply just water, and it is the largest ingredient in your nutrient solution.

The primary macronutrients are nitrogen, phosphorus, and potassium, or NPK. Nitrogen helps plants to create protein cells properly, and it makes photosynthesis possible. Phosphorus is used to strengthen the cell membranes inside your plants. Potassium is used by plants to grow because it signals compounds and facilitates cellular movement within the plant.

There are also three secondary macronutrients: calcium, magnesium, and sulfur. Sulfur helps molecules inside the plant to bond with each other more easily. That will help new growth to stay strong. Magnesium is used to facilitate photosynthesis further, and calcium is used to strengthen the plant’s cell walls. The micronutrients used by plants are boron, chlorine, copper, iron, manganese, molybdenum, and zinc, and these all play their part in helping the macronutrients effectively function inside the plant.

Measuring The Nutrients In The Solution

As mentioned previously, too many nutrients in a solution will cause your plants to suffer from nutrient burn. This can be misdiagnosed as a pest problem because of how it weakens the plant and discolors its leaves. An EC reader is used to test the electrical conductivity of the nutrient solution to see how many nutrients are present. Nutrients dissolve in the water and become ions, which, in turn, increase the electrical conductivity of the solution.

An EC reader will either have an end you stick in the water, or a cord with a couple of metal prongs on it. These prongs may look like an electrical cord, but they’re put into the water so that the reader can blast some

electricity through it and measure how well it flows. The EC reader will return a reading of the ppm or the mS/cm. The ppm is the parts per million, and it lets you know how many ions are in the solu- tion. The mS/cm is the most important number in hydroponics, and it refers to the Siemens present. Siemens is a type of unit used to describe electrical conductivity explicitly, and it is read as a number similar to the pH level. An average mS/cm for a hydroponic crop is between 1.2 and 3.3, but the exact number you want will depend on what you are growing.

Too low an mS/cm, and the plants won't get enough nutrients to stay healthy. Too high an mS/cm, and the plants will burn themselves out absorbing too many. Using your EC reader will let you know whether or not the nutrient mixture is too strong. Unlike the pH level, the mS/cm level of the nutrient solution can be adjusted by diluting the mixture with more water. An EC reading will not be able to tell you how many of each type of nutrient there is, as it is reading the ions of the dissolved nutrients and not the nutrients themselves.

Since the Kratky method is primarily designed to be a system that is set up once, then forgotten about until harvest, it is vital to get the EC level right during the build phase. You can monitor the system to check the mS/cm level, but it shouldn't be a problem unless you are growing a crop like tomatoes, which needs lots of fresh batches of nutrient solution.

Chapter Summary

✓ Plants uptake nutrients through the roots. The vascular tissue then pulls the nutrients up through the plant. Plants have tiny pores on the leaves that release water vapors. The negative pressure created through this release helps to distribute water (and therefore nutrients) throughout the plant.

✓ Different nutrients are absorbed at different rates. Pre-packaged nutrients for use in hydroponic systems come balanced with this fact accounted for.

✓ If you are mixing a nutrient solution from raw materials, then mix your macronutrients in one container, and your micronutrients in another, before combining them in the reservoir.

✓ Nutrients come in three forms: Primarily macronutrients, secondary macronutrients, and micronutrients.

✓ Fertilizer is used not to feed plants, but to feed the microorganisms in the soil, which helps to breakdown the nutrients so that the plants can drink it. Hydroponic systems use inert growing media, and so there are no microorganisms to benefit from fertilizer. Instead, all the nutrients that plants would get from fertilizer come from the nutrient solution.

✓ Plants require hydrogen, oxygen, and carbon, which they get from the air and the water.

✓ Primary macronutrients are nitrogen, phosphorus, and potassium.

✓ Secondary macronutrients are calcium, magnesium, and sulfur.

✓ Micronutrients are boron, chlorine, copper, iron, manganese, molybdenum, and zinc.

✓ Nutrients dissolve in water to become ions. These ions can be measured using an EC reader. Most crops want an mS/cm reading between 1.2 and 3.3. Too little mS/cm, and the plants won’t get enough nutrients. Too high, and they will damage themselves, trying to absorb too many.

✓ Ensure that the mS/cm level is properly balanced during the building process since the Kratky system shouldn’t be opened after it is started.

In the next chapter, you will learn what needs to be done to monitor the plants grown in a Kratky method system.

CHAPTER EIGHT : MONITORING THE SYSTEM

The reason that the Kratky method is the best approach for beginners is due to the way it is a “set it and forget it” approach to gardening. When it is being used for crops like lettuce or spinach, those that take to it well, you shouldn’t have any reason to need to open up the system or tinker around with the pH and EC levels or to add new nutrients to the solution.

The keyword here is “shouldn’t.” Plants are living organisms, and this often means that they have a mind of their own. Problems like disease or pests can cause hassles, roots can get stuck and unable to feed adequately, plants can overfeed and damage themselves, or fungus and mold can start growing in the system.

The best way to keep your Kratky system functioning efficiently is to perform regular monitoring of your plants. This

can take as little as five minutes a day or as much as an hour. It depends on how large your growing operation is and whether or not you run into snags.

Creating A Monitoring Schedule

The act of creating a monitoring schedule is so that you can track precisely which plants you have looked at and when you have looked at them, so you can make notes on any issues or possible issues that you have noticed. This last point is especially significant because it can let you get the jump on potential dangers as they are developing rather than after it is all too late.

Simply take a piece of paper and list out the different plants you have growing. If you are only using a single container to grow, then you can just number the plants and refer to them numerically. If you are using more than one container, then give each receptacle an alphabetical listing, and number the plants therein, so that the third plant in your second container would be B3.

Each day, go through the monitoring activities listed in this chapter and check them off on your schedule. Leave enough room to take any notes you may have. This will allow you to make sure you check off each plant rather than forget one, and the notes can be a preventive measure in keeping your Kratky method system healthy.

Monitoring For Pests And Illness

Pests like aphids, whiteflies, fungus gnats, spider mites, and thrips are all common pests that gardeners need to learn to deal with. Pest control will be covered in detail in the next chapter, but it deserves a mention when discussing monitoring.

The best way to prevent pests from attacking your plants is to use a combination of neem oil spray and attentive monitoring. Dilute neem oil with water as described on the package, put it in a spray bottle, and regularly apply it to your plants weekly. Neem oil is a naturally occurring pesticide that isn’t harmful to you or your plants. Neem oil makes your plants taste disgusting to pests so that they won’t want to feed on it.

Attentive monitoring for pests is a three-step process. First, take a piece of tissue or toilet paper, and rub the bottom of the plant’s leaves. A few pests are hard to spot with the naked eye, and a couple of them are basically invisible. They enjoy hanging on the bottom of a plant’s leaves to avoid detection further. If your tissue paper comes back streaked with blood, then there are pests present that you will have to deal with.

The second step is to check for damage to the leaves or the plant’s stem. Discoloration, holes, weird residue, or wilting leaves are all signs of a possible pest problem. If you find signs of damage but no signs of pests, then you may be dealing with disease or nutrient burn.

Finally, while this is more common in gardens that use soil, check the growing media to see if there are any signs of pests. Many species lay their eggs in the soil around the stem of the plant. These eggs then hatch, and you can see the young pests writhing around in the soil. While this is far less common in hydroponic systems due to the inert nature of the growing media, it is still known to happen on occasion, and early identification will help to prevent the need for a drawn-out extermination.

Monitoring For Unhealthy Or Dead Leaves

While you are checking the leaves of your plants for signs of pests, also pay close attention to their health. As mentioned, signs of damage without signs of pests can point towards disease. The best step to tackling disease is to prune away unhealthy leaves and branches. This has the benefit of maintaining your plants' health.

First, removing unhealthy or diseased material can prevent the spread of disease through other healthy tissues of the plant. Doing so can also remove disease from your hydroponic system as a whole, as an infected plant left untended is prone to spread its sickness to the other plants that are present.

The other reason why it is so helpful is that it allows the plant to redirect its energy away from unhealthy pieces and focus on growing the rest. This is one of the reasons to prune your plants in general. An example that highlights this is the way that peach growers prune their plants. As the peaches start to form on the branch, growers will remove peaches that are clustered together, so that those fruits they leave on the branch are evenly spaced. While it may seem weird to remove the fruit you are trying to grow; this leads to a harvest of larger, tastier peaches since the energy spent growing four small fruits clustered close together can instead be used to grow two. Each peach gets more energy, and so it becomes bigger. This same idea crosses over to any of the plants you might grow in your Kratky method system.

Unhealthy leaves don’t just look bad; they steal energy that should be used on healthy ones.

Monitoring For Shape And Size

Pruning is done to remove redundant leaves and stems, and it’s also done to control the plant’s size and shape. This type of pruning is more aesthetic than practical. Still, if you are growing any sort of houseplant in your Kratky method system, then the aesthetic appeal is probably going to be of interest to you. When you prune your plants in this manner, there is a simple process that you need to be aware of. When a plant is growing too tall, pruning it vertically to shorten, it doesn’t just reduce its height. It also changes the way the plant will then spend its energy growing. When cut down vertically, plants respond by focusing their growth outwards horizontally. So, when a plant grows too tall, you prune off the top, and it starts to get fatter.

If you then prune your fatter plant to reduce its horizontal size, it will then direct its energy towards growing vertically again.

Being mindful of the cuts you make will allow you to control the way your plants grow. But this can then become a slightly troublesome process when you consider the pruning we did to remove unhealthy branches in the last section. These cuts are still going to trigger the same response from your plant. So, while you may want your plant to be growing horizontally, pruning away unhealthy horizontal branches is going to convince it to grow vertically. While you could just prune away the top to try to counteract this, it isn't a very good idea.

Each time you prune your plant, you are cutting away one of its limbs, and this shocks its system. It takes time to recover from a wound like this. So you don't want to be making a lot of cuts all at once. Using the schedule you made at the beginning, take note of when you prune your plants and what direction it was cut in. This information will let you know which direction each plant is going to grow, and how long it has been since it was pruned. Wait a few days before pruning again.

Note, waiting to prune again applies to aesthetic pruning. Regardless of when you pruned a plant, remove unhealthy parts when you spot them. The shock of a cut isn't ideal for your plant. Anyhow, that's preferable to allowing an illness to spread throughout its body.

Monitoring For Cleanliness

While the Kratky method is one of the cleanest hydroponic systems, that doesn't mean that you can ignore the importance of keeping your grow area clean. You know to check your plants to prune away dead leaves that are sapping their energy, but you might be surprised to learn how important it is to remove fallen leaves, too.

Dead and fallen leaves may land on the nutrient solution's lid, in the growing medium itself, or on the ground around your Kratky method system. If you have set up your system outdoors, then you don't need to worry about leaves on the ground, just remove those that are on the lid or in the growing medium. Indoor gardeners need to remove these and be extra careful to monitor any dead plant matter which may have fallen around the system. This plant matter should be disposed of immediately, either by tossing it into the compost or taking it outside.

The reason this is so important is that dead matter can become a breeding ground for dangerous pathogens and bacteria. When left unattended, these harmful microorganisms will eventually start to explore and look for new places to feed and live. What this means for the hydroponic gardener is that disease and sickness spread from this discarded matter to infect your healthy plants.

Another source of disease and sickness is stagnant water. When you are putting together your Kratky system, make sure that everything is wiped down afterward, so that the

only water left around the system is the nutrient solution itself. Removing stagnant water and dead plant matter might not seem that significant when you are doing it, but just let it go for a few weeks, and you'll see how quickly it causes your plants to wilt and die.

Monitoring The Solution

Using the Kratky method, you shouldn’t have to monitor the solution. However, plants like tomatoes will need it very much. So learning how to do it isn’t a bad idea by any means.

If you bought an opaque receptacle for your nutrient solution, then you shouldn’t have to worry about algae forming inside. However, an opaque container makes it harder to see where the water level is. One way around this is to use a flashlight to see the silhouette of the water. So you will check the level. Another way that could be useful is to cut an extra hole in the lid when creating your system and plugging it with a securely fit cork. Then, you can pull out the cork and see how much nutrient solution is left.

Removing the lid after building the system isn’t recommended when it comes to the Kratky method. It’s going to upset the roots of your plants, expose the nutrient solution to direct light and allow the possibility of harmful bacteria or substances like dirt and dust to get into the mix. Keep the lid on at all times unless you absolutely must check something.

An example of a time you must check is when you notice discoloration in the leaves but no signs of pests. As this could be nutrient burn or worse, you will want to use your EC and pH meters to check the solution and make sure there aren’t any problems. Be very careful when removing the lid, or add a quick check hole during the

build phase, so you can take readings while the cover is in place.

Chapter Summary

✓ The Kratky method is best for beginners, thanks to how easy it is to build and the straightforward maintenance. But this doesn't mean there it requires no monitoring at all.

✓ Start by creating a monitoring schedule to keep track of when you're doing this. Leave enough space to make notes of any possible concerns or issues that might be developing.

✓ Use a piece of tissue or toilet paper and rub the underside of any leaves. If you see any streaks of blood, then you have some pests who've decided to make a home out of your plants.

✓ Spray diluted neem oil on your plants once a week to help prevent pests.

✓ Check for damage like bites, holes, residue, or discoloration when you monitor your plants.

✓ Look in the growing medium to see if you can spot any signs of larvae or other young pests that are preparing to snack on your plant's stem.

✓ Any time you see dead or unhealthy looking leaves on your plant, remove them. These suck strength away from healthy plant matter; removing them will result in larger plants. These can also cause disease or hide pests.

✓ When you prune your plants, make as few cuts as possible to reduce the amount of stress they undergo.

✓ When you prune away the top of a plant, it begins to grow sideways. When you prune the sides, it starts to grow upwards. Keep this in mind to control your plant's

growth, and be aware of how cuts made to remove disease or sickness will affect the plant's growth.

✓ Time should be allowed to pass between pruning sessions, but if you note unhealthy or diseased branches, then these should be removed immediately even if the plant was pruned recently.

✓ Stale water left around your plants is a recipe for introducing harmful bacteria and pathogens into your growing environment.

✓ Dead and fallen leaves that are left to rot around your Kratky system are also harmful because they fester bacteria and pathogens. They also offer more places for pests to hide. Check for dead plant matter daily.

✓ Opening the cover to your Kratky reservoir is a poor idea because it allows for harmful entities to get into the nutrient solution. Only open the lid to check the nutrient solution when there are signs that nutrient burn or disease is impacting their growth.

✓ One way to make it safer and easier to check the nutrient solution is to cut an extra hole into the lid. Keep this hole tightly plugged at all times. When you have a reason to check the nutrient solution, unplug this hole to take your readings, and tightly secure it after you are done. This decreases the size of the opening and reduces the amount of harmful entities that can slip in.

In the next chapter, you will learn what steps should be taken to prevent pests or diseases from getting into your Kratky method hydroponic system. These practices will allow you to keep your plants safe and healthy

throughout the growing process and keep pests like thrips and aphids away.

CHAPTER NINE: PEST CONTROL AND PREVENTION

As much as every grower would like to avoid them, pests are going to be a problem at some point in your hydroponic experience. The more crops you grow, the higher your chances of having to battle these annoying little menaces.

As we've already covered, the best way to deal with pests is to prevent them in the first place. Our three primary ways to do this are our weekly application of neem oil, the addition of a fan to make it harder for them to land on your plants, and netting hung to make it more difficult for pests to reach your plants in the first place. When you combine these practices, you reduce the likelihood of infestation. However, you don't eliminate it.

Since pests are always a threat, it is important to learn about those ones you're most likely to encounter and how to deal with them. If you are being mindful of monitoring your system and keeping notes about any concerns you notice, then you should spot pests before

they get a chance to get a foothold in your hydroponic garden. It is far easier to fight off an infestation when detected early. When spotted too late, an infestation can easily kill off your plants and spread throughout your garden in a matter of days.

The Six Common Pests And How To Control Them

There are all sorts of different pests that hydroponic gardeners may need to confront. However, if you have a pest problem, then the chances are good that you are dealing with one of the following six creatures. Use this information to identify, prevent, and control any issues you might have with them.

Of note, indoor gardeners are going to need to worry about pests just as much as outside gardeners. But indoor gardeners don’t have the benefit of releasing beneficial insects such as ladybugs into their garden to feed on pests. At least, not without then having to remove those beneficial insects from their home and creating even more work. But, indoor gardeners should keep their plants away from open windows and in areas without much foot traffic. Add a fan, and always wash your hands before handling your plants to decrease the likelihood of indoor infestation.

Aphids: Aphids are small, pear-shaped insects with fat bodies and tiny little legs. They are most commonly green, but they can be found in all sorts of earthy colors like Orange, brown, or red. Aphids are usually found in large groups, as they multiply quickly. Look for them on the tips of leaves or around the ends of stems. They bite into your plants to suck out the juices on the inside. This process allows aphids to produce a white substance called honeydew. Honeydew is a sugary substance that can attract other pests. Even when honeydew doesn’t attract any pests, it still leaves your plants at risk of

developing mold. Leaves that aphids have drained take on a misshapen appearance and stop growing.

If you find aphids on your plants, then the first step is to blast them off with some pressurized water. This will knock many loose and reduce the size of the infestation. Next, mix a few drops of soap into some water and spray it over your plants. Mainly apply this soapy water mixture to any areas you saw the aphids and to the bottoms of the leaves. You may want to add a teaspoon of vegetable oil into this mix as well. Repeat this process once a week and continue treating the plants with neem oil every week. If caught early enough, this treat- ment will clear away the problem in one to three applications.

Fungus Gnats: One of the more common pests that indoor growers will face, fungus gnats look like tiny black

mosquitoes, but they feed on the blood of your plants rather than yours. While fungus gnats don’t cause as much damage as most pests, they are still an unwelcome addition to any garden and should be immediately removed before they can start to breed.

Fungus gnats are attracted to moisture, and they are particularly prone to attack hydroponic systems. Unfortunately, they are also one of the harder pests to eliminate. A fan will make it harder for them to land on your plants, but once they’ve taken up a residency, this will no longer help. Continue applying neem oil to discourage feeding, and sprinkle a little bit of cinnamon on the areas they are most strongly gathered. The antifungal properties of cinnamon will help to drive them away. Beyond that, invest in a few stick insect traps to reduce the population. Fighting a fungus gnat infestation is pretty much a war of attrition.

Mealybugs: Only a couple of millimeters long, these gray pests are named for the gross white material they leave behind. This mealy white substance looks like little puffs of cotton and indicates infestation. When you spot this substance, it will most likely cause you to have a dismayed reaction because everything about it looks wrong on your plants. Found primarily on the bottom of leaves, mealybugs also secrete honeydew and attract both other pests and mold.

Mealybugs are one of the pests that like to hide in and around the roots of plants. As this isn’t easy for them to do in a Kratky system, it isn’t the biggest threat. However, if your system isn’t very tightly secured, then mealybugs can easily get inside and hide from view until they have drained your plants dry.

Mealybugs are quick to spread from one plant to another, and so you need to act rapidly once they are spotted. Take a cotton ball and dip it in some rubbing alcohol. Press this to anywhere you see their residue to break it down and destroy it. You can also press this alcohol-soaked cotton ball onto the bugs themselves to kill them quickly. While a spray of soapy water can be beneficial, a spray of diluted rubbing alcohol is more likely to work. That said, mealybugs are notorious for sticking around even after being treated several times. If they are present, you can expect lots of work to control them.

Since mealybugs spread so quickly, you should immediately isolate any plant that has been infected. If you are growing more than one plant in the same nutrient solution, then you are better off tossing out the infected plant and immediately treating those remaining with rubbing alcohol. It is better to sacrifice the few to save the many when it comes to dealing with mealybugs in a Kratky system.

Scale: These pests can be easy to misdiagnose if you aren't aware of their existence. They have a body that looks like a thinner ladybug, but they are an earthy brown color. When they settle in place on a leaf to start feeding, they look like tiny bumps have formed on your plants. While they stand out once you know about them, they have a very natural appearance, and many growers spotting the first couple can easily mistake them for particles of mud or minor damage.

There are two types of scale that growers commonly encounter: soft scale and armored scale. Soft scales are much easier to deal with because their backs aren’t protected at all. This makes treatment with liquids much more effective.

Armored scales have a protective layer covering their backside that makes them much more resistant, which makes battling an attack much harder.

If you spot a bump or a brown mark on your plants, investigate it immediately to determine whether it is damage or a pest like scale. Scales can be pinched and

crushed or brushed off the plant upon sight. By being vigilant and always investigating any oddities you spot, you increase your chances of identifying their presence before they take hold too strongly. This is necessary because a scale infestation isn't easy to get rid of. It takes multiple treatments, and even that doesn't guarantee success. Often, the infestation grows too massive, and the plant needs to be isolated and disposed of.

Treat scale the same as you do mealybug by using a q-tip or spray bottle to apply rubbing alcohol. Dilute it with water first if you are spraying. Neem should be applied together with rubbing alcohol, spraying directly onto the infested areas. Remember to continue treating the rest of the plant with neem oil as normally scheduled. You may be able to save an isolated plant by washing it thoroughly, and repotting it after all bugs are removed, but in a Kratky approach, it is often easier to just cut your losses and plant a new crop.

Spider Mites: Spider mites are very tiny and hard to perceive despite most often being a bright red color. What you are more likely to notice is the color draining from the leaves of your plants; they'll go from green to a sickly white. Spider mites move quickly from plant to plant, infesting a whole bed within a few days. Be on the lookout for leaves changing colors, as well as white webbing almost similar to mealybugs. Spider mites are a kind of miniature spider that feeds on plants instead of insects, but they still spin their own web. If you notice any web, keep an eye out. Regular sized spiders are a gardener's friend, but spider mites are a deadly foe.

Since spider mites are very small, a powerful spray of water will knock them off a plant, and you can actually remove great swathes of their population this way. Those that remain behind will cling onto your plants tightly and so treat them with a rubbing alcohol and neem oil routine. Use a spray bottle with diluted rubbing alcohol on the major sections of infestation, and use a cotton ball soaked in pure rubbing alcohol to apply onto any mites you spot directly. Look on the bottom side of leaves and around the soil. If the population grows again, spray the plant down again and isolate it from others to prevent spreading.

Whiteflies: Whiteflies love plants with plenty of leafy green foliage like lettuce or spinach. They look like tiny moths when they flap their wings, and little maggots when they rest on your plants to suck out the insides.

Like many pests, they like to hide on the underside of the leaves to avoid being detected. The easiest way to check if whiteflies are feeding on your plants is to give them a little shake and watch to see if a lot of white specks start flying around. Whiteflies also create honeydew when they snack on your plants, and this invites pests like ants and disease, mold, and rot.

If you don’t already have a fan arranged to blow on your plants, then get one and set it to strong. The airflow provided by the fan will make it harder for whiteflies to maneuver through the air due to their small size. Once the fan is set up, hit your plants with a strong stream of water to knock as many whiteflies off as possible. Those that are knocked off will be wet, and dealing with strong

air resistance, and they are unlikely to be able to find their way back.

Skip the rubbing alcohol and reach for the soap instead. Use soap and water in a spray and apply it over the affected areas. What this creates is a slippery surface that makes it hard for a whitefly to stand on, and so it becomes difficult for a whitefly to bite into the plant. When it does, the soapy taste is repellent; most whiteflies will give up and look for new plants to feed on. If you have other plants in the same Kratky system, then you can preemptively spray them with soapy water to reduce the likelihood of infestation spreading any further throughout the bed.

Chapter Summary

✓ The best way to avoid problems with pests is to take preventive measures.

✓ Apply neem oil to your plants week, consider adding a fan for air circulation, a net to make it harder for pests to get to your plants and always wash your hands before touching the system.

✓ Aphids are pear-shaped pests that suck on your plants and need to be washed off then treated with soapy water.

✓ Fungus gnats are common for indoor growers and are hard to get rid of. Cinnamon treatment will help, thanks to its anti-fungal properties.

✓ Mealybugs can be spotted by the white substance they leave behind and should be treated with rubbing alcohol. Treat scale with rubbing alcohol, then physically brushing them off from the leaves.

✓ Spider mites leave behind webbing as a tell-tale sign of infestation and should be treated with sprayed water and rubbing alcohol.

✓ Whiteflies look like little months and can be found by shaking the plant. Douse them with a spray of water, adding the wind from a fan, and then applying rubbing alcohol to infested areas.

In the next chapter, you will learn how you can manage the nutrient solution if you have to. That will include flushing the system and cleaning it out, as well as

learning how to identify common diseases and treat them.

CHAPTER TEN: MAINTAINING THE SYSTEM

The ideal crop growing in a Kratky system wouldn't require any maintenance at all. Many times this is precisely what happens, which is one of the many reasons this approach is so great. But there are occasions where you are going to have to check the nutrient solution and ensure that everything is working as it should.

In this chapter, we will see how to check our nutrient solutions, how to flush our systems when necessary properly, and how to identify common hydroponic diseases which require maintenance work to treat.

Managing The Nutrient Solution

The most crucial step in managing the nutrient solution used with this method is ensuring that it has the proper pH level when it is first organized. You may not have to recheck the nutrient solution during a grow if it is done correctly initially. However, if you start to see signs of nutrient burn or wilting that isn't linked to a pest, then you are going to have to know how to check the nutrients. Another possible maintenance step is to refill the nutrient solution when growing thirsty plants. For example, tomatoes like a lot of nutrient solution, and so you can wait until they drink it all, or you can slowly refill it before it is drained so that the roots don't stretch out so much that they are entirely submerged and drowned when the reservoir is refilled.

The pH level of your nutrient solution should stay in the right range throughout an entire grow, but there are always going to be times when something happens. Sometimes, this is because of a problem with the plant, such as an illness. Other times it is because something got into the reservoir through a crack. Sometimes, it isn't even anything to do with the system itself, but the degradation of the reservoir itself if it is old or made of particularly cheap materials. You should try to identify what is causing the issue at hand as you work so that you can fix it by addressing it and making changes to the system or your handling procedure. However, you still need to check the pH level and fix it.

Make sure that the area you are working in is clean. If you have a fan on, then turn it off now so that there is

less air blowing particles around. You want to make sure that you have washed your hands and are wearing clean clothes. If you have designed your Kratky system to have an easy access door on the cover, then you should use this for checking the levels. If you don’t, you are going to need to take the lid off. If you are using a rectangular reservoir, then try to rotate the lid so that the roots of the plants don’t need to leave the reservoir, and so the cover still blocks a large section of the nutrient solution. This isn’t possible with a smaller bucket; therefore be careful when dealing with the roots of your plants, and don’t set them down on any surface that hasn’t been cleaned yet.

Use either a pH test strip or an electronic pH reader to find out where the pH level is. While you are doing this, keep an eye out for any signs of algae growing in the nutrient solution. If you are using an opaque container, then this is not likely to be a problem. If the pH level is where it is supposed to be, then you can close up the system. If you need to adjust the pH level, you can mix in some General Hydroponics pH Up or pH Down. Gently stir the solution while being careful not to tangle up the roots of the plants any more than they already are. Recheck the pH level and fine-tune as is necessary. Replace the lid, and watch your plants over the next couple of days to see if they start to look livelier. If the pH level was a problem, then your plants should begin to deepen in color and stop wilting.

The other way of monitoring the nutrient solution is to slowly fill it up as it is drained to slow the size of root growth and allow thirsty plants to continue to get plenty of oxygen. When you approach Kratky hydroponics to grow plants of this type, there is a higher risk of issues with the hydroponic system. These can mostly be

controlled through being safe and mindful, but the very fact that there is more work to be done means the chance of mistake is higher. Beginners are advised to grow a few easier crops first before trying ones that you have to keep watering.

If you are going that route, you may want to consider using a transparent container for your nutrient solution. What that it does is allow you to look in and closely monitor the water levels and the length of the roots. Being able to see these clearly will let you know when you need to add more water. Since a transparent material allows the rays of the sun into the nutrient solution, and this promotes the growth of algae, you are going to need to use a tarp or something similar to cover up the sides of the container at all times, and you should never check the levels while in direct sunlight. If you are using an opaque container, then you are going to need to be very careful because you will be opening up the nutrient solution often, and every time you do this, you are taking the chance of harming the health of the system.

When you mix your nutrient solution at the beginning of working with a thirsty plant, it’s a good idea to mix more than you need. You can hold onto the extra to add it in over time. This isn’t necessary, but it can save you some time down the road. As the roots grow, add solution back into the mixture. How often you will want to do this depends on how much you are looking to slow the root growth. The goal is still to reach a level where all of the solution is absorbed by the end. So, rather than always filling the nutrient solution in full, you are filling it back up with half or three-quarters as much nutrient solution as they drank. As you work with a species of thirsty

plants, like cherry tomatoes, you will learn their habits and be able to fine-tune this.

Use your stored nutrient mixture or create a new one. Turn off any active fans, and with clean hands, carefully open the cover of the nutrient solution. Don’t place the roots of the plants on any dirty surface. Slowly pour the nutrient solution into the reservoir until it is at the desired level. Take a pH reading. If the pH level is still within optimal levels, then close up the system. If you need to adjust the pH level, then follow the steps outlined previously, and make sure the level is right before closing everything down. Repeat this process as necessary until it is time to harvest.

Flushing And Cleaning A Kratky System

A term that often pops up in hydroponics is “flushing.” There are two meanings of this word. It depends on if the conversation is about flushing the system or flushing the plants.

Flushing a system means to clean a system, only it is done in a certain way. Most hydroponic systems have hoses that the nutrient solution flows through regularly. These systems are flushed by having clean water, often with cleaning supplies added to it, moved through the system that has had the plants removed. An empty grow tray is put in place so that the cleaning solution can run through the system precisely as the nutrient solution does. This is done for several days, and then clean water is run through to rinse.

The Kratky method doesn’t use moving water, however, and so there is no “flush” that can happen. You have to wash the container and the lid used for the nutrient solution are both washed as you would any other dish, or almost. There should be almost no nutrient solution left after everything has been harvested, and you are preparing for the next crop. Anything that is left can be poured down a drain. Hot water and soap are used to wash the inside and outside. Wash the lid as well, on both sides. Rince this with clean water, and dry it with a fresh towel. Do this before planting any crop, including your very first one.

Flushing your plants refers to the act of switching the nutrient solution in a moving hydroponic reservoir with

fresh water. Gardeners do this for a week before harvesting their plants so that nutrients are expelled out of the growing medium prior to harvesting. They swear that this makes the plants tastier. This is an extra step that doesn't work with the Kratky method since there is no moving solution.

But, since there is no moving solution, that means that the growing media in the Kratky system was never filled with nutrients. So it naturally achieves the effect that other hydroponic gardeners have to flush their plants to accomplish. This allows you to have all of the taste with none of the extra work.

Regular Check-Ups

It is necessary to check on your plants regularly. The biggest sign that something is going wrong will come from your plants. They speak to us in codes of color and form. Discol- ored leaves or wilting are signs that there is something that is bothering your plant that you must address. If you aren’t making regular checks on the health of your plants, then you could miss some serious dangers when they were still treat- able. The same goes for pests.

Check-ups don’t need to be very hard. They only get tricky when you need to work with the nutrient solution, and since we already covered that aspect, the hardest step is already out of the way. All you need to do for a check-up is look over the leaves for discoloration. Try to see if they are looking strong or if they are showing signs of wilting, such as dropping or shriveling up. This is also a good time to be on the lookout for pests. Take a piece of tissue paper, rub it along the bottom of the leaves, and look to see if any pests leave behind a streak of blood.

Spotting And Treating Disease

There is a huge range of diseases that can infect both a single plant and your hydroponic system itself. When you are performing regular check-ups, you can spot disease as it is beginning, and this gives you the best chances at curing it and saving the plant.

Powdery Mildew: You can mistake this disease as a sign of mealybugs because it starts out looking very similar to the white residue they leave. But white spots might be a sign of powdery mildew, which starts on the top of your plant's leaves in spots and then starts to spread out to envelop the entire leaf. Underneath the top layer of white mildew, you can see the leaf change colors as all the life is sucked out of it. This spreads from one leaf to another and through the stem until the entire plant is encased, and it withers into nothingness.

This is a rather common disease, and so we should be thankful that it is comparatively easy to treat. When identified, remove any infected leaves. It begins on leaves, so ideally, catch it before it spreads to the stem, and you have to lose a branch. You may want to treat the plant with a natural fungicide like Serenade Garden’s, which you can find on Amazon.

Powdery mildew requires high humidity to thrive. If you identify it, then you would do well to consider lowering the humidity in the growing space and increasing the airflow. If you are using a grow light, then move it half an inch closer to the plant. This will alter the environmental conditions that powdery mildew requires, and, if you’re lucky, you shouldn’t have to deal with it again. It is easy

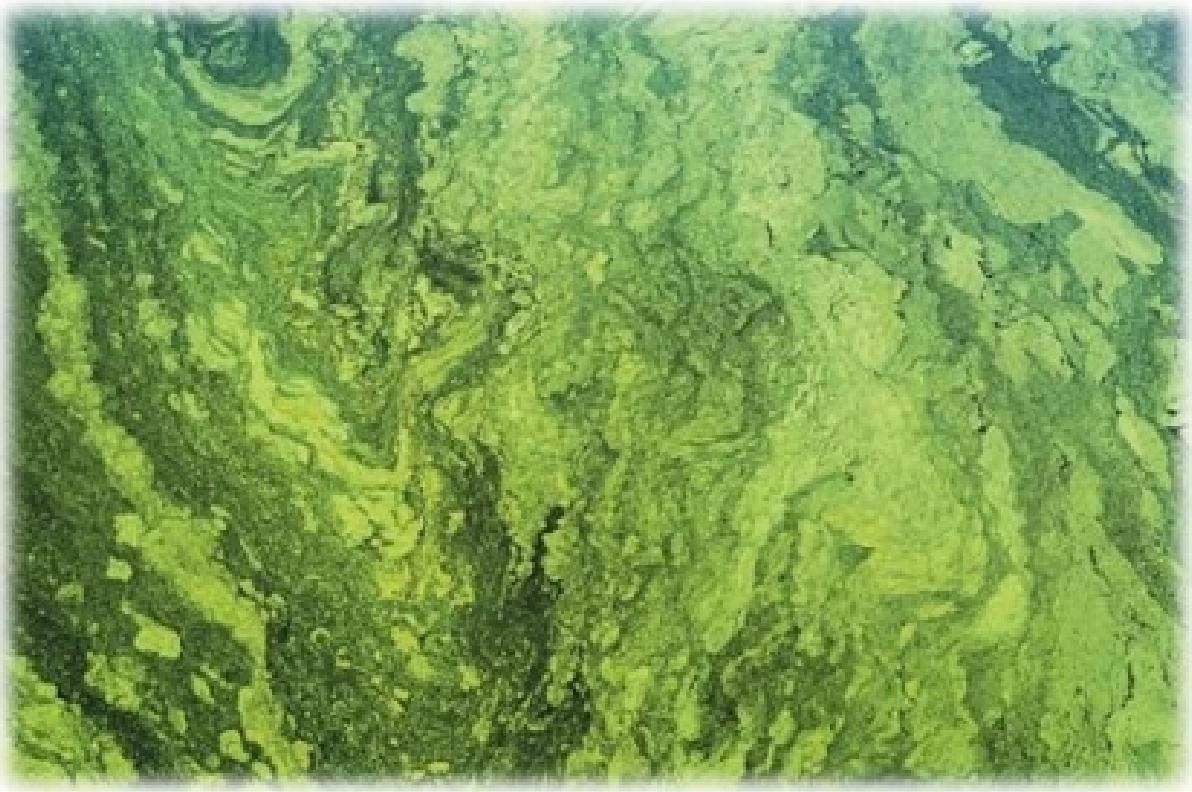
to beat if caught early. But if it’s allowed to establish itself, you may lose the plant.

Grey Mold: Another common disease is grey mold, which goes after the leaves of your plants when the humidity is too high. True to its name, it’s a light grey color that looks like tiny hairs growing off the leaf. If you spot it early, then you can deal with it, and you shouldn’t even need to use a fungicide. If it goes unnoticed, then it can kill a plant at lightning speed.

If you spot grey mold, then you should immediately get a clean cloth and use it to brush the mold from the leaf. If it hasn’t obtained a firm hold yet, then it will come off quickly. Check the rest of the plant, as well as any others that share proximity, and remove any other mold you find. Make sure that you dispose of the mold by removing it from your house or your garden, and thoroughly washing the cloth you use afterward. Make sure that you are keeping the growing area clean of dead plant matter, as discussed in chapter eight since grey mold loves to grow in this matter and then spread to your living plants.

After you have removed all plant matter and grey mold, lower the humidity level of the grow area, and turn on a fan if you haven’t had one already. If you eliminate the environment that it festers in, then it won’t be able to make a comeback.

Algae: If you are using an opaque container, then you can avoid getting algae 99% of the time, but it is one of those things that just always has a way of turning up. A little bit of it isn't going to do any harm and can be removed easily. You shouldn't bother opening up the nutrient reservoir to remove a tiny bit of you spot it. Still, if you are opening it up anyway for other purposes, then there's nothing wrong in using the opportunity to remove algae.



Algae grow best in stagnant water, so it can be a big problem in a Kratky system that is not properly protected from exposure to sunlight. If you are growing with a clear reservoir system, then you are much more likely to grow algae. However, you are also opening the reservoir much more often with transparent systems, so you can remove algae before it builds up. Algae is more of an unsightly phenomenon than anything else, but when a lot of it

builds up, it can mess with the roots and make it harder for the plants to feed appropriately. If enough algae gather so that the roots can't get through to the solution, then they will wither and die.

The only way to spot algae is to look into the reservoir, and so checking for it shouldn't be a part of your regular check-up. But any time you have to open up the reservoir, you should make sure you also perform an algae check and remove it whenever it is present.

Damping Off: This happens to seeds and seedlings at the start of a new crop. When you plant your seeds into their rockwool cube, the cube is moistened, and then kept moist throughout the entire germination and seedling phase of its growth. This is required for a seedling to properly grow healthy roots that dangle down into the nutrient solution below. But this requirement comes at a cost.

If the top of the rockwool is allowed to be overly moist, then you can start to notice the stem of the seedling turning black and slimy. This is a sign there has been too much moisture in the growing medium. Of course, we want plenty of moisture to be there, but we also want it to drain quickly, so it doesn't damage the seedling. Damping off will quickly kill your seedlings because they are very vulnerable when they are small. If you notice damping off, then it is already too late to save the plant. Use the finger test to ensure the top inch of the growing medium is dry before misting it with more water.

Stop misting it as soon as the seedlings are big enough for their root to reach the nutrient solution in the reservoir below.

Nutrient Burn: Nutrient burn is a common problem that many hydroponic gardeners run into. Those that aren't mindful of the pH level or the mS/cm level are sometimes under the impression that the more nutrients in the solution, the faster the plants will grow. Unfortunately, the equation isn't so simple, and they are going to see the leaves of their plants begin to curl up and lose their color. If they catch it early, they might be able to do something about it to save the plant, but all the damage done is permanent. If it's left untreated for too long, the effects can be fatal.

None of the other diseases that commonly attack hydroponic plants have this focus on the edge of the leaves. Some pests attack the edges of the plant. When this happens, you can link the damage to the parasites. If you see the edges of the leaves changing, but can't connect the effect to any pests, then you may have

spotted early nutrient burn. It is common for the leaves to bend and start to brown on the tips and then spread down the sides of the leaf. This is often paired with a deeper green color in the body of the leaf itself. While a deep green is usually a sign of health, when a single leaf takes on a deeper color than the rest, consider this a warning sign to check its tips.

If you identify it early while only the tips of the leaves have been damaged, then you can prevent any further damage by immediately pulling the plants out and checking the pH level of the nutrient solution. Get an mS/cm reading as well, and see if you need to add more water to dilute the solution. Bring the level down into the proper range. Use clean water to rinse off the roots of the plants before you place them back into the freshly leveled nutrient solution. Close up the system and pay careful attention to the leaves of the plant over the following days to see if symptoms progress or halt.

Chapter Summary

✓ While the Kratky approach requires less maintenance, some work is still necessary.

✓ Don’t open up the nutrient reservoir unless you absolutely need to, such as when signs of nutrient burn lead you to test the pH level, or you need to add more solution for thirsty plants.

✓ Turn off any present fans and clean any surfaces which plant roots may touch.

✓ It is better to turn the cover of the nutrient solution when possible so that you can access the solution to take the reading, and the roots can stay submerged.

✓ Add pH Up or pH Down as required.

✓ When replacing nutrient solution for thirsty plants, you can control the speed of root growth by adding more regularly instead of only when the reservoir is dry.

✓ Thoroughly clean a Kratky system between each crop.

✓ You don’t need to flush the plants in a Kratky system because no nutrient solution passes through the growing media.

✓ Regular check-ups ensure you catch deadly diseases and pests before they become major problems.

✓ Powdery mildew looks like the residue left behind by mealybugs, and it starts in patches on leaves. Treat it with fungicide and remove any infected leaves.

✓ Grey mold grows in dead plant matter. If spotted early, it can be brushed off easily.

✓ Algae grow in the nutrient solution. A little algae is not an issue, but a lot of it can block roots from getting to the solu tion. Remove algae you spot whenever the nutrient reservoir is opened for other maintenance.

✓ Damping-off has no cure and quickly kills seedlings. When young plants are misted too often, this disease sets in, always allow the rockwool in which you planted your seeds enough time to dry.

✓ Nutrient burn begins on the edges of leaves and indicates that the solution is too concentrated and needs to be diluted.

In the next chapter, you will learn the most common mistakes beginners make when growing plants using the Kratky method. You can use this knowledge to get ahead of others and avoid falling into the same traps they have.

CHAPTER ELEVEN: DEALING WITH COMMON MISTAKES

It doesn’t matter the skill-set. It could be martial arts, cooking, writing books, or entering data; there are always going to be mistakes that beginners make again and again. Hydroponic gardening is no different in this manner, and it doesn’t matter whether you are using the Kratky method or not. There are still mistakes that are easy to make, some of which we covered in the last chapter, for example, overfeeding nutrients to the point of burning the plants. Since you already know that one, we won’t bother going over it again, but the rest of these mistakes crop up again and again. Save yourself a lot of time and grief by avoiding them in the first place so you can grow like a pro.

Checking The PH Level At The Wrong Time

I know that your first thought on reading that was, “Yes, I already know I have to double-check the pH level when I build the system.” You’re quite right, but you must check it at the right time in the building phase. You are going to put together the nutrient solution, and make sure that it has the right pH level when you mix it up the first time, but you also need to take a reading once the roots of the plant are in the solution. The roots will change the pH level a little bit, and if you are aiming for a specific level, then you are going to want to be aware of small changes because they have huge implications.

When you are maintaining the nutrient solution during a grow, it is best to rotate the lid of the reservoir rather than remove it. So the plants can keep their roots in the solution.

First, this will avoid accidentally causing any damage to the plants or infecting them through exposure to a dirty surface or the like. What it also does is leave the roots present, so that the pH level you get is as accurate as possible.

Make Sure You Can Reach All The Plants

Indoor gardeners most often make this error because of a limitation of space. Setting out enough room for a hydroponic system requires a little bit of planning. While there is the system itself, there is also other equipment which takes up room. Lights, fans, and humidifiers are common additions to a hydroponic garden, and they all need to be placed somewhere. When space isn't considered prior to setup, it isn't uncommon for gardeners to have certain plants that are hard to reach.

Since the Kratky system is mostly able to function on its own, a hard-to-reach plant might never prove to be an issue. But hard-to-reach plants don't get monitored or cleaned up as much or as often as the easier-to-reach plants do. When there is a sudden spread of disease or pests through a system, the cause is more often than not a plant that was tricky to get to. It didn't receive the care necessary to identify the problem early enough to take preventive steps.

If you have to choose between growing three plants that are easy to access or growing four plants with one that is awkward to reach, then it is better to go with less. If you are determined to grow all four plants, then you are going to need to rearrange your growing space so that you can be sure of adequate access to the fourth plant. If you can't, then you're potentially creating a Trojan horse for disease and pests. It is more important to grow safely than to grow more.

Drowning The Roots

While most beginners start with a plant like lettuce, which grows well in a Kratky system, some are going to go straight for tomatoes or other thirsty plants. While this is recommended, this particular mistake also affects those with more experience who switch over to thirsty plants for the first time. Learning about it now can save you problems down the road.

Growers working with these plants should be slowly adding more nutrient solution to their system to slow the rate that the plants drain the system. While this means opening the system more often and exposing it to danger, careful gardeners shouldn’t have a problem. But there are two mistakes specific to refilling that may happen regardless of whether safety protocols were followed or not. Both errors will drown the roots of the plants and can result in a smaller yield or worse.

The first misjudgment is to allow a thirsty plant to drain the reservoir completely, and then to fill it back up. As the roots get longer in a Kratky system, they can get more oxygen. Filling up the reservoir fully, again and again, will submerge them entirely, and change how much oxygen they can use. This is unlikely to kill the plant, but it can result in a smaller yield. If you want to use this approach and still get a large yield, then a pump and an airstone will need to be added to the system, and this is going to require logistics and electricity.

A worse mistake is to overfill the tank regularly. The intention of adding nutrient solution back in as the plant

is drinking, is to slow the speed of draining, not to halt it. Allow two or three days between adding nutrient solution, and always add no more than three quarters the amount that was absorbed since the last time. If you keep adding the same amount back in every day, then the level will never change, and the roots will be unable to get any oxygen; this could result in the plant drowning.

Using Cheap Equipment

One of the best features of the Kratky approach to hydroponics is the fact that you don't need very much gear to get started. Since there aren't any moving parts or a whole lot of equipment required for this approach, there aren't as many pieces that could break down and cause an issue. None-theless, there are two pieces of a Kratky system that beginners can mess up.

The first is in the nutrient solution. The quality of most nutrient solutions is going to be high enough to use without any problem. The real concern with the nutrient solution is making sure that beginners purchase the right nutrients. If you are mixing a ratio that is out of whack or you've confused one nutrient with another, then the solution might do the plants no good at all. It is better to stick to a premade package like the General Hydroponics line. This has everything that you need with instructions on use and information on everything inside.

The other problem area with equipment is the lighting. Purchasing low-quality lights can result in plants that aren't getting enough light or even plants that aren't getting any. Plants need a specific range of lights, so when you purchase LED grow lights, you need to make sure that they have been made specifically for plants. It may be cheaper to purchase an LED light you saw at the dollar store, but just because it lights up the room and appears to you to be the same, that doesn't mean that your plants will react to it in a positive manner. Grow lights are going to be much more expensive than other LED lights, but your plants won't survive without them.

Make sure you buy high quality like the Hytekgro lights or Phlizon’s 600W plant light, which you can find for $80 on Amazon. The investment in quality will make a major difference in the health of your plants.

Not Researching Your Plants

While any book on gardening can give you the basics you need to get started, much of the information found within these pages has to be a generalization of the rules. The truth of the matter is that every single species of plant is going to behave differently, and many of the subspecies of a single plant behave differently from others despite being of the same family. This gives the plant kingdom an amazingly profound level of variability that is impossible to break down into concrete rules that admit of no exceptions. For this reason, a gardener needs to learn how to conduct research on the plants they want to grow, so that they understand how to care for it and produce large yields.

Research doesn't need to be difficult. We live in the age of easily-accessible knowledge, and the internet provides thousands upon thousands of articles and gardeners who are writing about plants and their experiences with them. You should start by going to Google, and searching the name of your plant along with "required pH level," "required temperature," "how often to water," "how to fertilize," and any other questions that you are going to need to answer. Google will often provide you with the information so that you don't need to even go to a website. But many of the websites you come across will have the answer to your question, as well as the answer to others you were planning to ask next. Repeat this until you have all the answers you need.

If you aren't overly tech-savvy, then you can always visit your local garden center and ask the employees there.

They should be knowledgeable and be able to answer your questions. Most have the resources to find out the answers if they don’t already know them. If the plant you are looking to grow is sold locally, then you may also consider visiting a farmers’ market and asking one of the people selling. This can be a terrific way to turn research into a social activity and get to meet some like-minded gardeners who are filled with tips and tricks of their own.

When you ignore research and assume you know enough to work with a species you’ve never raised, then you are just inviting problems and mistakes. The term research is often thrown around like it isn’t fun, but this doesn’t have to be the case. Researching plants is both fun and easy, and a step you should be taking before every new crop.

Not Cleaning Often Enough

We’ve already covered the importance of cleaning the area around your hydroponic setup. Dead plant matter

invites mold and pests, and the easiest way to deal with these issues is to avoid having them in the first place. Because you know this already, I trust that you will be cleaning up your grow area. But the question isn’t if you are cleaning it, but if you are cleaning it often and thoroughly enough.

If you are removing dead plant matter from your plants when you are checking on them, then this should be a daily activity. If you only clean your plants from time to time, you are allowing more time for disease to take hold and develop. You are also not checking them enough to catch early warning signs of issues. Check your plants every day and clean away dead matter when you do.

Don’t just settle for removing the dead matter that is on the lid of the solution or in the net pots along with the growing medium. You need to also check around the floor or surface that the system is set on. Plant matter often falls to the side, and this can be overlooked during a check that focuses on the leaves and branches of the plant. You should be cleaning around the system every day to ensure that there are no hidden threats ready to jump out and start destroying your plants.

Going With “Clean Enough”

When you first buy the material to make your Kratky system, and between each and every crop, you need to wash the system out properly. Many beginners purchase their supplies and immediately start to put them together. It is easy to understand their excitement and eagerness to get started, but it is important to slow down and clean everything first. New equipment might be clean of stains or obvious dirt, and so it will look “clean enough”, and you may consider skipping over it.

But clean enough isn’t good enough. We’re not cleaning to get rid of stains but to get rid of bacteria and contaminants, which are too small to see with the naked eye. You aren’t going to be able to tell if there is something harmful on the equipment or not, and so it is best always to clean everything before it is used. When you do this, you eliminate the danger that something is present. If there was nothing harmful there, then you have only lost twenty minutes of your time, but if there was something harmful clinging onto the equipment, then you have saved yourself hours and days of time and energy battling illness or pests.

This point should also be applied to the previous mistake so that you never consider the growing area to be “clean enough.” It is either clean because you’ve just cleaned it, or it is dirty and needs to be cleaned. If you are going to be opening up the lid of the nutrient reservoir, then you need to double up on your cleaning and make sure that any surface the roots might end up touching has been cleaned as well.

Chapter Summary

✓ The best time to check the pH level of the nutrient solution is while the roots of your plants are still in it as they change the level slightly.

✓ Make sure that you can easily reach all of the plants you are growing so you can monitor them for warning signs of disease and pests.

✓ Continually filling up the nutrient reservoir in a Kratky system doesn’t allow the roots any room to breathe, and this can drown the plant.

✓ Cheap equipment isn’t a huge problem with the Kratky approach, but it is possible to purchase the wrong nutrients or ineffective lights by accident.

✓ You should always research every species of plant you are going to grow before you plant them. Knowledge is power; every plant is unique in its needs.

✓ A dirty growing space is an invitation for disease and pests. Scrupulously clean your growing space and remove dead plant matter from the system and the area around it.

✓ Harmful pathogens and germs are impossible to see. Clean any surface your plants might touch, wash all buckets and pots when they are bought and between each crop, to reduce the chances of infection.

FINAL WORDS

We've covered a lot of information in this book. It is worth taking a moment to reflect on what you have learned and where everything is located so you can easily reference it as needed as you encounter problems and face new challenges with your new Kratky system.

Chapter One explored the science of hydroponic gardening to see why it has been taking off lately with both professional and amateur gardeners alike. This introduced you to the six most frequently discussed methods that are used.

Chapter Two introduced the simplest hydroponic system there is, the Kratky method system. This system was shown to not only be the best pick for beginners, but it was also invented with the express purpose of being easy and cheap enough for people in third world countries to use. Yet, despite its low cost to build, the Kratky system can provide amazing results when used for smaller plants like lettuce.

In Chapter Three, you learned that there are many pros to working with the Kratky approach, such as the low cost, the ease of learning, the lack of mess, and a smaller amount of required maintenance. You also learned that

there might be a few drawbacks, such as it being a bad fit for larger plants. But when the pros and the cons are weighed, it is easy to see that the Kratky approach is a terrific way to go for growing small plants.

Chapter Four looked at ten crops that grow amazingly in the Kratky system and hydroponics in general. Herbs and lettuce are great plants for beginners to start on; tomatoes and cucumbers offer a challenge, but can also be tremendously rewarding. We moved from crops to gear in Chapter Five, where you learned exactly what equipment is required to build your own system.

In Chapter Six, you put together your own system by following easy to understand steps to fit together all the pieces you purchased from the previous chapter. Once the system was made, you learned about the nutrient solution and the best growing media to use in Chapter Seven. Together, these two chapters should cover everything you need to know about building your first Kratky system and seeding your very first crop.

Chapters Eight, Nine, and Ten went into the issues of monitoring and maintenance so that your plants are kept healthy and free of pests. You learned how to monitor the system in Chapter Eight, how to prevent pests in Chapter Nine, and how to maintain the system and identify disease in Chapter Ten.

Finally, Chapter Eleven laid out common mistakes that are often made when gardeners first begin working with hydroponic setups. These mistakes are simple to avoid but would cost you hours of headaches and frustration when ignored.

By following this structure of knowledge, building, and maintaining, this book has been following the same pattern you will follow with each of the plants you grow in your Kratky system. When you begin to work with a new species, you initially need to research and gather knowledge about it. From there, you need to either build a new system for it to grow in or clean one you already have. Finally, you need to pay close attention to the crop to make sure that it stays healthy and free from harm. Then, just like these final words, you will go over the whole process again with the next plant.

Beginning with the Kratky system will prove to be an effective and simple way to get into hydroponic gardening. You can use the knowledge you've gained in this book to get a taste for hydroponics before building a more elaborate system with circulating water, or you can stick with the Kratky method to easily grow plenty of delicious crops. Many gardeners decide to go with both, making a more compli- cated system for bigger plants but also continuing to grow crops with the Kratky system they began with.

Wherever your journey with hydroponics takes you, we hope that you have found this an enjoyable beginning. If you have, then please tell your friends about it, and invite them to join you by reading this book and making their own system.

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